WHITE-TAILED PRAIRIE DOG CONSERVATION ASSESSMENT


White-tailed prairie dog photo by Ron Stewart

RECOMMENDED CITATION

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TABLE OF CONTENTS

List of Tables

LIST OF FIGURES

EXECUTIVE SUMMARY

On 11 July 2002, the U.S. Fish and Wildlife Service (USFWS) was petitioned by the Center for Native Ecosystems, Biodiversity Conservation Alliance, Southern Utah Wilderness Alliance, America Lands Alliance, Forest Guardians, Terry Tempest Williams, Ecology Center and Sinapu to list the white-tailed prairie dog (*Cynomys leucurus*) under the Federal Endangered Species Act (ESA). After the petition was received, the White-tailed Prairie Dog Working Group of the 12-State Prairie Dog Conservation Team began development of a Conservation Assessment for the white-tailed prairie dog to assess the current status of the species range-wide and address possible threats limiting conservation. Data integrated into the Conservation Assessment came from an assemblage of sources including published literature, Environmental Impact Statement reports for energy clearances on potential black-footed ferret (*Mustela nigripes*) habitat, and State and Federal grey literature. These sources provided the information used to index temporal population changes, evaluate gross changes in occupied habitat, and examine current management of white-tailed prairie dogs within each State. A risk assessment for the species based upon the five listing criteria used by the USFWS when evaluating a species' potential for listing under the ESA is included.

In order to provide the most scientifically accurate assessment regarding the current status of the white-tailed prairie dog, two types of data were analyzed. The first data set indexed population changes at Black-footed Ferret Management Areas. The second data set evaluated gross changes in occupied habitat at mapped locations in individual States. Both data sets have weaknesses and limitations as described in the text, but are the best available data for this assessment. The incorporation of both data sources provided a more complete assessment of the range-wide status of the white-tailed prairie dog by describing changes not only with regard to numbers of animals, but also examining the distribution of occupied habitat across the range. In addition to the population and occupied habitat data analysis, a Geographic Information Systems (GIS) spatially detailed, Predicted Range Model for the white-tailed prairie dog was produced. This model provided information on the number of hectares in the gross and predicted ranges of the species and the amount of its range being impacted by anthropogenic disturbances.

In 1981 with the discovery of black-footed ferrets at Meeteetse, Wyoming, States within the historic range of this species initiated programs to identify complexes of white-tailed prairie dogs as potential reintroduction sites for black-footed ferrets. Because white-tailed prairie dogs and black-footed ferrets occur sympatrically, evaluation of suitable habitat for black-footed ferrets was dependent upon describing the size and spatial arrangement of colonies and densities of prairie dogs within these areas (Forrest et al. 1985, Biggins et al. 1989, 1993). To aid in further evaluation of prairie dog habitat, Biggins et al. (1989, 1993) developed a technique that involved counting active burrows within 1 km x 3 m transects distributed over colonies. The active burrow data was then converted to prairie dog counts and finally to an estimate of density. Although burrow counts may be inaccurate at producing precise population estimates of white-tailed prairie dogs, they are useful for indexing abundance over large scales of time and space. Since no long-term monitoring data are available from sites where black-footed ferret reintroduction is not a consideration, the evaluation of temporal population changes of white-tailed prairie dog populations is based solely on surveys at black-footed ferrets reintroduction sites.

To quantify gross spatial changes that have occurred in occupied habitat within the range of the white-tailed prairie dog, colonies and complexes that were mapped in response to specific energy project clearances as well as those mapped in the identification of potential black-footed ferret reintroduction sites were compared to more recent mapping efforts. Direct comparison in the estimation of occupied hectares of prairie dog colonies is problematic and needs to be evaluated with caution. White-tailed prairie dogs exhibit a mosaic pattern of distribution making accurate mapping of colony boundaries difficult. Distribution, burrow density and activity levels are also extremely variable throughout a complex or colony. Much of the mapping of colonies therefore relies upon use of topographic features, substrate variations or the best estimate of the investigator, making many mapping efforts a reflection of suitable rather than occupied habitat. Until variation between mapping efforts can be described and compensated for, mapping can only provide a gross approximation of white-tailed prairie dog occupied hectares. These gross approximations however, are meaningful in areas that have experienced significant declines or increases. In areas where changes have been less extreme, mapping cannot produce comparable results.

Population information analyzed in the Conservation Assessment show that white-tailed prairie dog populations can fluctuate year-to-year with calculated coefficient of variations ranging from 14 to 91% in areas surveyed in Utah and Colorado. Large annual fluctuations of white-tailed prairie dog estimates within colonies were reported in Shirley Basin, Wyoming. Continued population monitoring is needed to assess the level of observed fluctuations and resultant long-term projections of population viability. The data available are not sufficient to evaluate whether white-tailed prairie dogs currently exist at lower densities and experience more extreme fluctuations in numbers than they did historically.

Changes in occupied habitat show that white-tailed prairie dog distribution is dynamic, with white-tailed prairie dog occupation shifting on a landscape scale. No clear pattern emerged to account for increases or decreases in occupied habitat, though information such as plague monitoring and periodic habitat evaluations were not available for most sites. Significant declines and increases in occupied habitat that could not be attributed to mapping error were apparent in the Little Snake Black-footed Ferret Management Area, Colorado (92% decline from 1994-1999); Cisco complex, Utah (84% decline from 1985-2002); for all colonies in Montana (83% decline from 1975-2003); and portions of Shirley Basin, Wyoming (50% increase from 1990-2004). This evaluation of occupied habitat underscores the importance of evaluating white-tailed prairie dog populations on a landscape scale in order to provide an accurate range-wide assessment of the status and distribution of this species. Colonies must remain arrayed across the range in both viable, isolated colonies and complexes that allow repopulation of depleted colonies and complexes, yet do not encourage spread of plague between complexes.

Concern over the long-term viability of white-tailed prairie dog populations is warranted. It appears that some individual colonies and complexes are prone to significant declines without recovery to previous occupied habitat or population levels (e.g., Little Snake, Colorado). Other areas however, appear able to recover rapidly after significant population declines (e.g., Kennedy Wash increased from a low of 3,670 white-tailed prairie dogs (3.07 prairie dogs per ha) in 2001 to 10,282 white-tailed prairie dogs (8.60 prairie dogs per ha) in 2002). Why there is a difference between recovery sites is unknown. It may be due to the continued re-nfection of areas by plague and lack of immigration into areas after infection. Plague may be the reason that colonies and complexes show such dramatic oscillations in densities and shifts in occupied habitat. Prior to the introduction of the disease, populations were likely more stable, providing a reliable prey source for such species as ferruginous hawks (*Buteo regalis*) and development of a specialized predator like the black-footed ferret. The role that plague has and will play in the overall decline and biogeographic dynamics of white-tailed prairie dogs is a critical question for future management and research. Plague remains the unknown factor in the equation for conserving the white-tailed prairie dog. Though work is being conducted on the ecology of the disease and oral vaccine development is proceeding, managing for the effects of plague epizootics will be an immense challenge for resource managers and scientists.

Historically, white-tailed prairie dogs have been displaced from areas by conversion to agriculture, urbanization, and oil/gas exploration and extraction, and negatively impacted by habitat alterations due to livestock grazing and fire suppression. Conversion of habitat to cultivated agriculture is not occurring at a significant rate today and currently only 3.6% of the gross range is being impacted by this activity. Urbanization is a concern in local areas but does not represent a significant range-wide threat affecting only 0.2% of the gross range. Loss of habitat due to oil/gas development under current Bureau of Land Management (BLM) policies may be a significant threat. In Wyoming, 77% of the white-tailed prairie dog predicted range is being developed at some level for oil and gas.

Livestock grazing practices have impacted the white-tailed prairie dog range by drastically altering the landscape through introduction of non-native annuals, increased shrub cover, loss of cool season grasses and lowered water tables. The BLM, which manages 56% of the white-tailed prairie dog gross range, has reduced stocking rates and improved range conditions in some areas, but upland habitats are difficult to restore and options for their restoration are lacking. Thus, continued research into the impacts of habitat alterations on white-tailed prairie dogs and techniques to restore upland habitats need to be undertaken.

Shooting has the potential to contribute to reduction and fragmentation of populations, lower colony productivity and slow or preclude recovery rates of colonies reduced by plague or other disturbances. Shooting has been shown to result in the removal of pregnant females and young of the year, promote increased emigration, and negatively impact behavior in black-tailed prairie dogs. Coupling shooting with population unknowns such as size, body sex and age structure, fecundity, survival rates and disease cycles, makes it impossible to predict the long-term affects of shooting on white-tailed prairie dog populations. However, shooting, unlike plague, is a manageable threat to white-tailed prairie dogs. State wildlife agencies need to develop programs to evaluate their current regulatory authorities and measures to ensure that they have mechanisms to regulate take of white-tailed prairie dogs.

As early settlement of the Intermountain West occurred, the prairie dog became the focus of widespread eradication efforts largely as a result of their reputation as range and agricultural pests (Clark 1989). Poisoning became less common after the 1970s because the government began to regulate poisons and early eradication efforts appeared to be successful. Limited poisoning continues today, mostly on private lands and is used for containment rather than large-scale eradication. Only toxicants registered by the Environmental Protection Agency (EPA) may be legally used to control prairie dogs. Because the bulk of the white-tailed prairie dog range is located on public land, poisoning can be controlled by agencies.

White-tailed prairie dogs have become a focal species for many State and Federal management agencies over the past few years. Utah and Montana have implemented State-wide seasonal shooting closures on public lands to help conserve this species. The U.S. Geological Survey (USGS) and U.S. Department of Agriculture (USDA) are working on programs to monitor plague, develop methods to help prevent epizootics from impacting colonies and predict areas susceptible to infection. State agencies have started to monitor known colonies/complexes, map additional areas and work cooperatively with other agencies and among States to develop intensive monitoring programs using statistically valid estimation techniques. Elimination of detrimental management activities can be instituted to manage and potentially expand the occupied hectares of this species. By implementing management actions at local, State, and Federal levels, including regulation of shooting, elimination of mandatory control and pest status, incorporating better grazing and fire management practices, adopting incentive programs for private land owners, field research to provide a scientific basis for decisions, long-term monitoring of populations, and public outreach and education, the long-term viability of this species will be assured.

At this time the White-tailed Prairie Dog Working Group does not believe listing the white-tailed prairie dog as threatened under the ESA is justified. The information analyzed across the range of the white-tailed prairie dog showed that some individual colonies and complexes are prone to significant declines with little post recovery to pre-decline levels, while other colonies and complexes exhibit rapid recovery to pre-decline levels. With the current data available it is impossible to determine whether populations across the range occur at lower densities and occupy less area than they did historically. It is also impossible to predict a long-term trend due to the short-duration in past monitoring (3-7 years) and the lack of definitive patterns emerging among the populations monitored. The fact remains however, that white-tailed prairie dog populations are continuing to maintain themselves even when faced with disease and human disturbances. The biggest concern is that the ecosystem as a whole is not as productive or stable as it was historically. Colonies and complexes show dramatic oscillations in densities and shifts in occupied habitat. With the possibility that current populations are more dynamic, there is concern over the viability of associated wildlife species that are dependent on white-tailed prairie dog populations.

WHITE-TAILED PRAIRIE-DOG CONSERVATION ASSESSMENT

Introduction

Five species of prairie dog inhabit western North America and they differ with regard to current conservation status. The Mexican prairie dog (*Cynomys mexicanus*) is federally listed as endangered in Mexico (50 C.F.R), the Utah prairie dog (*C. parvidens*) is listed as threatened (17.11 CFR.) and the black-tailed prairie dog (*C. ludovicianus*), formerly a candidate species for listing (65 FR 5476-5488) is still of conservation concern. The white-tailed prairie dog was petitioned to be listed as threatened under the ESA on July 11, 2002, by the Center for Native Ecosystems, Biodiversity Conservation Alliance, Southern Utah Wilderness Alliance, America Lands Alliance, Forest Guardians, Terry Tempest Williams, Ecology Center and Sinapu. The Gunnison's prairie dog (*C. gunnisoni*) was petitioned to be listed on February 23, 2004 (Forest

Guardians 2004). Both the white-tailed and Gunnison's prairie dog petitions cited habitat loss, shooting, disease, a history of eradication efforts and inadequate Federal and State regulatory mechanisms as threats to the long-term viability of this prairie dog species. After the petition to list the white-tailed prairie dog was filed, the National Wildlife Federation and Environmental Defense contracted with Dr. Craig Knowles to prepare a status review summarizing current knowledge of white-tailed and Gunnison's prairie dogs. This contract resulted in the publication, *Status of White-tailed and Gunnison's Prairie Dogs* (Knowles 2002). In this document, Dr. Knowles stated, "It is clear that state and federal conservation agencies need to make a range-wide effort to develop credible status reports on these two species."

The 11 States included in the range of the black-tailed prairie dog began a multi-State conservation effort in 1998 with the formation of the Black-tailed Prairie Dog Conservation Team. This team was responsible for development of a range-wide Conservation Assessment and Strategy for the Black-tailed Prairie Dog (Van Pelt 1999). In addition, the team published an addendum to the Conservation Assessment and Strategy entitled, *A Multi-State Conservation Plan for the Black-tailed Prairie Dog in the United States* (Luce 2003). In March 2002, the Black-tailed Prairie Dog Conservation Team was expanded to include both white-tailed and Gunnison's prairie dogs. Expansion of the team was warranted because many of the management issues such as survey protocols, identification and ranking of threats, regulation changes, recreational shooting, management plan frameworks, relocation techniques and long-term monitoring are similar for all prairie dog species. State wildlife agency biologists from the white-tailed and Gunnison's prairie dog States, all of whom except Utah were already on the Black-tailed Prairie Dog Conservation Team, formed a White-tailed/Gunnison's Prairie Dog Working Group which agreed to emulate, where possible, methodologies and expertise developed during the black-tailed prairie dog multi-State conservation effort. The Black-tailed Prairie Dog Conservation Team was subsequently renamed the Prairie Dog Conservation Team in September 2002 and the Western Association of Fish and Wildlife Agencies' Interstate Coordinator's duties were expanded to include coordination of conservation for all three prairie dog species. The Prairie Dog Conservation Team continues to meet annually to evaluate and discuss range-wide management goals for black-tailed, white-tailed and Gunnison's prairie dogs.

Following the process used to address range-wide conservation of black-tailed prairie dogs, the Western Association of Fish and Wildlife Agencies' agreed at its July 2002 meeting to develop a range-wide Memorandum of Understanding that would implement a similar collaborative effort and result in Conservation Agreements for white-tailed and Gunnison's prairie dogs. Specific conservation objectives in the draft Memorandum of Understanding were:

1. Quantify current population status and trends of both white-tailed and Gunnison's prairie dogs by collecting and analyzing population estimates and distribution data throughout their ranges and from this information develop multi-State management planning efforts.

2. Develop partnerships with communities, industries, interested entities, private landowners and government agencies to design and implement conservation strategies to preserve and/or restore suitable habitat as well as maintain and enhance present distribution and abundance of white-tailed and Gunnison's prairie dogs.

3. Conduct monitoring of temporal and spatial population trends on a landscape scale to evaluate conservation strategies to stabilize and increase white-tailed and Gunnison's prairie dog occupancy and abundance.

4. Conduct rigorous and repeatable scientific experiments to determine detrimental effects of human induced disturbances and disease on white-tailed and Gunnison's prairie dog populations and from this research develop responsible management objectives.

On March 4, 2003 the Western Association of Fish and Wildlife Agencies' President Jeff Koenings sent letters to the USFWS Regional Directors, Dale Hall and Ralph Morgenweck, detailing the intent of the States to prepare Conservation Assessments for both white-tailed and Gunnison's prairie dogs. The Western Association of Fish and Wildlife Agencies' proposed to the USFWS that the States take the lead role in writing the Conservation Assessments, and that the USFWS use the documents produced as the basis for the 90-day and 12-month finding for both the white-tailed prairie dog and Gunnison's prairie dog petitions.

In December 2002, the White-tailed/Gunnison's Prairie Dog Working Group began development of a Conservation Assessment for the white-tailed prairie dog. The objectives put forth by White-tailed/Gunnison's Prairie Dog Working Group to be incorporated in the White-tailed Prairie Dog Conservation Assessment were--1) summarize and evaluate the current distribution and population status of the white-tailed prairie dog across its historic gross range; 2) develop a Predicted Range Model; 3) identify specific threats impacting the viability of the species and 4) identify management and research options for consideration in the future development of a conservation strategy for the white-tailed prairie dog. Data used to meet the objectives of the White-tailed Prairie Dog Conservation Assessment included published literature, Environmental Impact Statements for energy clearances on black-footed ferret habitat and State and Federal grey literature. From the information collected, temporal population changes and gross spatial changes in occupied habitat across the range were examined, current and historic management of white-tailed prairie dogs within each State was evaluated and a risk assessment for the species based upon the five listing criteria used by the USFWS when evaluating a species' potential for listing under the ESA was completed.

WHITE-TAILED PRAIRIE DOG

Taxonomy

The family Sciuridae is a successful and widespread family comprised of 49 genera and 262 species. Included in this family are tree and ground squirrels, chipmunks, marmots and prairie dogs. Prairie dogs, like other ground squirrels, have characteristic flattened heads, straight claws, short tails and unspecialized ankles (Lawlor 1979). As a group, prairie dogs diverged from ground squirrels about 1.8 million years ago during the late Pliocene or early Pleistocene (Clark et al. 1971).

Today there are five extant species of prairie dogs, all of which inhabit western North America and belong to the genus *Cynomys*. The genus has been divided into two subgenera based on pelage color and tail length (Clark et al. 1971, Pizzimenti 1975). The white-tailed, Utah and Gunnison's prairie dogs comprise the subgenus *Leucocrossuromys*. This group is distinguished by relatively short, white-tipped tails, weaker social organizations and less specialized dentition and morphology than the black-tailed forms (Pizzimenti 1975). The black-tailed subgenera, *Cynomys*, which includes the black-tailed and the Mexican prairie dogs, have characteristic long, black-tipped tails and are more specialized morphologically, behaviorally and ecologically (Pizzimenti 1975). The black-tailed prairie dog occupies short or mixed-grass prairies across much of the Great Plains while the Mexican prairie dog is restricted to a small area of grasslands in northeastern Mexico (Goodwin 1995). The *Cynomys* subgenera, shows the greatest divergence from ancestral ground squirrel stock (Pizzimenti 1975).

Within the subgenus *Leucocrossuromys*, the Gunnison's prairie dog is genetically, morphologically and behaviorally distinct from the other two white-tailed species (Pizzimenti 1975). The Gunnison's prairie dog retains a chromosomal makeup more closely resembling that of other ground squirrels suggesting a more recent divergence (Pizzimenti 1975, Goodwin 1995). Genetic analysis conducted on populations of white-tailed and Gunnison's prairie dogs in Ouray, Delta and Montrose counties in Colorado, confirmed that the genetic makeup of these two species was unique (Pizzimenti 1975).

In general, both Utah and white-tailed prairie dogs inhabit more xeric habitats at relatively lower elevations than the Gunnison's prairie dog which is commonly found at mesic, high elevation sites (Pizzimenti and Nadler 1972). Utah and white-tailed prairie dogs are antigenically similar and may have once belonged to a single interbreeding species (Pizzimenti 1975, McCullough et al. 1987). Pizzimenti (1975) described the white-tailed and Utah prairie dogs as allospecies due to the geographic isolation of their populations by the Fish Lake and Wasatch Plateaus of central Utah. The white-tailed prairie dog is considered a monotypic species with no suggestion of the existence of a subspecies (Fitzgerald et al. 1994).

Description

The white-tailed prairie dog can be distinguished by the presence of a short white-tipped tail and distinct facial markings that consist of dark black or brown cheek patches that extend above the eye (Fitzgerald et al. 1994). The white-tailed prairie dog differs from the Gunnison's prairie dog by lacking a black-band on the tail and retaining white for the entire terminal half (Clark et al. 1971). The Gunnison's prairie dog is also smaller, has a darker coloration, and the facial marking are less striking than those exhibited by the white-tailed prairie dog (Fitzgerald et al. 1994). The white-tailed prairie dog differs from the Utah prairie dog by having a pelage coloration that is less reddish and more grayish (Hollister 1916).

The white-tailed prairie dog weighs between 650-1,700 g (Fitzgerald et al. 1994). The total body length of the white-tailed prairie dog is 315-400 mm with a tail length of 40-65 mm (Fitzgerald et al. 1994). Male white-tailed prairie dogs are typically larger than females (Fitzgerald et al. 1994).

Distribution

The white-tailed prairie dog occupies the third largest geographic range within the genus *Cynomys* (Knowles 2002). White-tailed prairie dogs inhabit intermountain basins, open shrublands, semi-arid to arid shortgrass steppes and agricultural lands of Utah, Montana, Wyoming and Colorado (Pizzimenti 1976a, Hall 1981, Clark and Stromberg 1987, Fitzgerald et al. 1994) (Figure 1). Their gross range occurs from extreme south-central Montana (0.9% of range), south through Wyoming (62% of range), extending into western Colorado (21% of range) and eastern Utah (16% of range) (Table 1; Figure 1). The gross range of the white--tailed prairie dog encompasses 20,224,807 ha (49,974,813 ac) (Table 1; Figure 1).

The gross range of this species is thought to have changed little since historic times, but occupied habitat and population densities probably declined within the last century (Knowles 2002). Attempting to quantify a decline is difficult due to the lack of accurate historical data prior to the introduction of plague, habitat alteration and loss and onset of historic eradication campaigns (Anderson et al. 1986, Knowles 2002). Even today, estimates of distribution, occupied habitat and densities across the range and at known complexes are inadequate for management purposes.

Natural History

Habitat Requirements

White-tailed prairie dogs occur at elevations ranging from 1,150 m (3,772 ft) in Montana (Flath 1979) to 3,200 m (10,498 ft) in Colorado (Tileston and Lechleitner 1966, Fitzgerald et al. 1994). In Utah, white-tailed prairie dogs have been found at elevations from 1,280 to 2,438 m (4,199-7,999 ft) (Boschen 1986, Cranney and Day 1994, Intermountain Ecosystems 1994). Luce (Interstate Coordinator Prairie Dog Conservation Team, pers. comm.) recorded elevations at 11 white-tailed prairie dog complexes in Wyoming that ranged from 1,300 m (4,265 ft) near Manderson in the Bighorn Basin to 2,300 m (7,546 ft) along the Wyoming-Colorado border south of Rawlins. Other researchers documented white-tailed prairie dog occupied habitat in Wyoming within the same elevational range (Menkens 1987, Orabona-Cerovski 1991, Grant 1995).

White-tailed prairie dogs require deep, well-drained soils for development of burrows. Utah prairie dogs require burrows to be located on soils at least 1 m (3.3 ft) deep over the caliche layer for successful hibernacula establishment (Coffeen and Pederson 1993 in Wagner and Drickamer 2002). Soils commonly found on white-tailed prairie dog colonies are derived from sandstone or shale parent rocks and are described as clay-loam, silty clay or sandy loam (Forrest et al. 1985, Clark et al. 1986, Boschen 1986, Patton 1989, Wolf Creek Work Group 2001). Topography of inhabited areas is flat to gently rolling with slopes of less than 30% (Forrest et al. 1985, Collins and Lichvar 1986).

A majority of white-tailed prairie dog habitat occurs in semi-arid to arid areas with mixed stands of shrubs and grasses. These habitats occur in areas that have high evaporation rates and low precipitation rates (Wolf Creek Work Group 2001, Knowles 2002). Documented annual precipitation ranges from 18 to 30 cm (7-12 in) (Flath 1979, Collins and Lichvar 1986, Patton 1989) and diurnal temperature can be extreme ranging from > 30°C (86°F) in summer to < -15°C (-59°F) in winter (McDonal et al. 1981, Forrest et al. 1985, Patton 1989). The majority of native plant communities within white-tailed prairie dog habitats have their main growing season from mid-April to the end of June (Wolf Creek Work Group 2001). Cool season plants that are able to use their stored winter moisture for growth dominate white-tailed prairie dog habitats that are generally dry from mid-June to mid-August. Late summer rains in August and September promote growth making early fall another period when nutritious and abundant food sources are available (Wolf Creek Work Group 2001).

Common vegetation associations on white-tailed prairie dog habitats are saltbush (*Atriplex* spp.) and sagebrush (*Artemisia* spp.) shrub communities that contain an understory of grasses and forbs (Kelso 1939, Gilbert 1977, Flath 1979, Forrest et al. 1985, Boschen 1986, Beck 1994, Cranny and Day 1994, Wolf Creek Work Group 2001, Knowles 2002). Saltbush associations occupy areas with fine-textured soils and are characterized by low growing, widely-spaced plants that vary in composition and density (Wolf Creek Work Group 2001). White-tailed prairie dog habitats in northwestern Colorado and Utah are dominated by shadscale (*Atriplex confertifolia*), mat (*Atriplex corrugata*) and Gardner's saltbush (*A. gardneri*); and to a lesser extent, Wyoming big sagebrush *(Artemeisa tridentata)*, black greasewood (*Sarcobatus vermiculatus*) and rabbitbrush (*Chrysothamnus* spp.) (Gilbert 1977, Boschen 1986, Cranney and Day 1994, E. Hollowed, BLM, personnel communication). Annual grasses (e.g., cheatgrass [*Bromus tectorum*]) and forbs dominate the herbaceous communities comprising much of the white-tailed prairie dog habitat in both Colorado and Utah (Boschen 1986, Wolf Creek Work Group 2001). In Montana, some colonies are dominated by saltbush with a variety of perennial forbs and a scant cover of big sagebrush (*Artemisia tridentata*) (Flath 1979). Others sites are dominated by winterfat (*Eurotia lanata*) and poverty sump weed (*Iva axillaris*) (Flath 1979). In Wyoming, species composition has been found to consist of western wheatgrass (*Agropyron smithii*), blue grama (*Bouteloua gracilis*), junegrass (*Koeleria cristata*), Indian ricegrass (*Oryzopsis hymenoides*), needle-and-thread (*Stipa comata*), broom snakeweed (*Gutierrizia sarothrae*), plains prickly pear (*Opuntia polycantha*), big sagebrush, greasewood (*Sarcobatus* spp.) and rabbitbrush (Menkens 1987, Orabona-Cerovski 1991, Grant 1995).

White-tailed prairie dogs, like other prairie dog species, are found in relatively open plant communities with short-stature vegetation (Tileston and Lechleitner 1966, Clark 1977, Collins and Lichvar 1986, Menkens 1987, Orabona-Cerovski 1991). Preference for open areas is probably due to their dependence on visual surveillance for predators and intraspecific interactions (Fitzgerald and Lechleitner 1974). Menkens (1987) near Laramie and Meeteetse, Wyoming, found that median shrub densities varied from slightly greater than 0 shrubs per m^2 to 0.3 shrubs per m^2 (0-3.2 shrubs per ft^2) and only rarely did he find shrubs to cover more than 5% of a sample grid. Median shrub heights measured on grids ranged from 24 to 35 cm (9.4-13.8 in). Similarly, Collins and Lichvar (1986) found shrub densities to range from 0.1 to 2.5 stems per m^2 (1.1-27 stems per ft^2) and shrub heights to be generally less than 66 cm (26 in) at occupied habitats in Meeteetse, Wyoming. From their analysis, Collins and Lichvar (1986) stated that plant height, rather than vegetation type, determined white-tailed prairie dog distribution. This has also been demonstrated for the Utah prairie dog where percent plant cover and plant height were considered more important than botanical composition in depicting distribution (Collier 1975, Crocker-Bedford 1976, Player and Urness 1982).

Total vegetative cover on white-tailed prairie dog colonies is highly variable with an average of 38% reported in Shirley Basin, Wyoming (Orabona-Cerovski 1991); a range of 45 to 83% at Meeteetse and Laramie, Wyoming (Collins and Lichvar 1986, Menkens 1987); and from 10 to 70% reported in Colorado (Tileston and Lechleitner 1966). Grasses generally comprise the highest percent of plant cover (Tileston and Lechleitner 1966, Collins and Lichvar 1986, Menkens 1987, Orabona-Cerovski 1991). White-tailed prairie dogs do not alter above ground vegetation structure as do black-tailed prairie dogs (Coppock et al. 1983, Collins and Lichvar 1986). Menkens et al. (1987) found no visual difference in the vegetation between colonized and uncolonized white-tailed prairie dog sites.

Dietary Requirements

White-tailed prairie dogs are primarily herbivorous with grasses making up the bulk of the diet, though other plants are consumed as plant phenology progresses. For example, sagebrush and saltbush are browsed by white-tailed prairie dogs during early spring before other green food is available, forbs are selected as they develop in early summer and after grasses and sedges flower, seed heads become the dominant food item in the diet (Tileston and Lechleitner 1966). Rabbitbrush flowers are consumed in late September and early October prior to hibernation (Tileston and Lechleitner 1966). Kelso (1939) found in examining the contents of 169 stomachs collected from white-tailed prairie dogs in Montana, that plants of the Chenopodiaceae family (saltbush, Russian thistle [*Salsola pestifer*], winterfat and goosefoot [*Chenopodium* spp.]) were found most often in the diet except during the months of April, July, August, and October when grasses appeared to dominate. In the Chenopodiaceae diet, Nuttall saltbush (*Atriplex nuttallii*) had the highest consumption rate whereas in the grass diet, wheat grass (*Agropyron* spp.) had the highest rate. Also found in stomach contents were sagebrush, wild onion bulbs (*Allium* spp.), pricklypear (*Opuntia* spp.), false mallow (*Malrastrum coccineum*) and a small amount of animal matter. Stockard (1930) examined 92 stomachs collected during the spring near Laramie, Wyoming and found them to contain weed and grass seeds, cactus roots and stems, sagebrush leaves, grasses and insects. Renner (Colorado Division of Wildlife (CDOW), pers. comm.) observed white-tailed dogs capturing and consuming Mormon crickets (*Anabrus simplex)* as well as foraging on the seed heads of wheat grass at Wolf Creek, Colorado.

The dietary requirements of the Utah prairie dog have been studied to a greater extent than those of the white-tailed prairie dog and because these two species inhabit similar arid habitats and are the most closely related of the five prairie dog species, the diet of the Utah prairie dog is discussed. Crocker-Bedford and Spillett (1981) found that Utah prairie dogs selected foods in the following order: *Cicadidae* insects, alfalfa, grasses, forbs, shrubs and dead vegetation. The preferred plant parts, ranked from most to least preferred, were flowers and seeds, young leaves, old leaves and stems. Hasenyager (1984) found that the Utah prairie dog diet was similar to that of the white-tailed prairie dog (Tileston and Lechleitner 1966) with cool season grasses dominating the diet in spring and other plants consumed at various times during the year.

White-tailed prairie dogs inhabit unpredictable, heterogeneous environments with short growing seasons and because of this do not remain active all year. During their active periods however, they must mate, give birth and build fat stores within a limited time frame making the quality and quantity of vegetation available to individuals an important mechanism in survival and reproductive ability (Beck 1994). High quality forage is considered necessary for reproductive females that must double their daily energy requirements to support reproductive needs and for accelerated ontogeny in juveniles (Crocker-Bedford and Spillett 1981). The amount of available cool season forage has been correlated with Utah prairie dog density estimates (Crocker-Bedford 1976). Rayor (1985) found that Gunnison's prairie dog colonies located in habitats with higher quality vegetation resulted in Gunnison's prairie dogs having a greater mass, accelerated sexual maturity and earlier dispersal than colonies located in lower quality vegetation sites.

Juvenile emergence in late May to June allows young prairie dogs to take advantage of abundant green vegetation in spring and early summer. Juvenile white-tailed prairie dogs mature physically and behaviorally more quickly than do black-tailed prairie dogs (Tileston and Lechleitner 1966, Clark 1977). After emergence, white-tailed prairie dog juveniles reach 88 to 100% of adult size within 120 days, approximately 2.5 months before black-tailed juveniles (Tileston and Lechleitner 1966, Clark 1977). Juvenile Utah prairie dogs have been found to consume up to 157 kcal per day (36 dry-grams of forage) (Crocker-Bedford and Spillett 1981) whereas juvenile black-tailed prairie dogs, who remain active throughout the year and live in a more stable environment, consume, on average, a 110 kcal per day (25 dry-grams of forage) (Hansen and Cavender 1973 *in* Crocker-Bedford and Spillett 1981). Grant (1995) found the most significant growth and increase in body mass of juvenile white-tailed prairie dogs occurred between emergence in early June and mid-July, the period which coincided with abundant above-ground biomass of succulent, highly nutritious grasses and forbs. After mid-July, juvenile body mass plateaus at approximately 120 days of age (Cooke 1993). During hibernation body mass for juveniles was found to decrease by 26 to 30% (Cooke 1993).

Prairie dogs lack an effective system for conserving water (Vorhies 1945, Schmidt-Nielsen and Schmidt-Nielsen 1952) and obtain most of their needed liquid from the plants they eat. White-tailed prairie dogs can become water stressed during their active season if sufficient succulent vegetation is not available. Collier (1975) found that higher moisture content in plants was correlated with higher population densities of Utah prairie dogs and higher moisture content was crucial to maintaining populations during times of drought. Utah prairie dogs have been found to travel 300 to 400 m in summer to access vegetation in moist areas (Crocker-Bedford 1976, Crocker-Bedford and Spillett 1981). Similarly, Koford (1958) found that black-tailed prairie dogs congregate near moist vegetation and new colonies and colony expansion will be more likely to occur in these areas. Gunnison's prairie dogs also use areas near the edges of wet meadows (Longhurst 1944). The presence of moist vegetation may be crucial to the maintenance of white-tailed prairie dog populations because without it, they can not remain active long enough to put on sufficient weight to guarantee winter survival (Beck 1994).

Population Dynamics

White-tailed prairie dog populations are reported to fluctuate by more than 50% between consecutive years (Menkens 1987, Menkens and Anderson 1989). In most cases adult variation in density (27-167%) was less than that reported for juveniles (124-348%) (Menkens 1987). Variation in densities between years and also among habitats is likely driven partly by local ecology such as site-specific topography, soil type, climate and vegetation quantity and quality. Hyper-productive environments have been found to correlate with higher densities of prairie dogs. For example, a comparison study examining the life history traits of the Utah prairie dog at three different locations found prairie dog densities to range from 2.3 prairie dogs per ha (0.9 per ac) at a high elevation site, 16 prairie dogs per ha (6.5 per ac) at a low elevation site and 36 prairie dogs per ha (14.6 per ac) at a low elevation site associated with an alfalfa field (Crocker-Bedford 1976). The difference in densities was attributed to quantity and quality of available vegetation. Turner (2001) found that after a plague epizootic severely reduced a population of Utah prairie dogs in Bryce Canyon, survival of juveniles, juvenile mass and the number of females successfully weaning young increased. These factors were thought to contribute to the rapid recovery of the population. The mechanism driving the increase in these three factors was unclear, but was thought to be due to the increase in resource availability after a population decline. Cooke (1993) found both yearling and adult females were more successful at weaning litters on sites with high quality food resources than those on poorer sites. In addition, female juveniles remained resident on their natal home ranges on higher quality sites.

Disease, especially the introduced pathogen *Yersinia pestis* responsible for sylvatic plague, may play a role in amplifying population fluctuations. Historically, white-tailed prairie dog populations were probably not static, but with the evolution of an obligate predator such as the black-footed ferret that relies on prairie dogs as their main food source, it is unlikely that populations fluctuated as dramatically as they do today. A plague free black-tailed prairie dog colony in the Wind Cave National Park, South Dakota provides an example (Hoogland 1995). Plague has never been detected within this colony and yearly population levels are relatively stable. This differs from a population at the Rocky Mountain Arsenal National Wildlife Refuge near Denver, Colorado where epizootics of plague are frequent and extreme population fluctuations are common (Biggins and Kosoy 2001b).

Reports on burrow densities vary greatly from location-to-location ranging from 0.8 to 291 per ha, (0.3-118 per ac) with a mean of 2.1 to 41.7 per ha (0.8-16.8 per ac) (Tileston and Lechleitner 1966, Clark et al. 1986, Menkens 1987, Orabona-Cerovski 1991). Collins and Lichvar (1986) found that burrows were widely distributed and equidistant from one another in white-tailed prairie dog colonies located in contiguous homogeneous suitable habitat. However, if colonies occurred within a mosaic of habitat types with not all areas suitable for prairie dogs, burrows were are ranged in a clumped pattern.

Ecology and Behavior

White-tailed prairie dogs cease above ground activity during periods when they are unable to meet metabolic needs (Michener 1977, Bakko and Nahorniak 1986, Harlow and Menkens 1986, Rayor et al. 1987). Lack of precipitation, extreme daily temperatures and/or lack of forage and water appear to be the ultimate factors in induced dormancy (Hudson and Bartholomew 1946 *in* Collier and Spillett 1975). White-tailed prairie dogs generally hibernate for 4 to 5 months during the winter and may aestivate during mid- to late summer, however timing of these patterns varies with latitude and elevation (Hollister 1916, Tileston and Lechleitner 1966, Bakko and Brown 1967, Pizzimenti 1976, Harlow and Menkens 1986, L. Renner, CDOW, pers. comm.). In Colorado and Wyoming, white-tailed prairie dog colonies have been reported to be active above ground from 7 to 9 months of the year with sexes and age groups maintaining different activity periods (Tileston and Lechleitner 1966, Clark 1977, B. Luce, Interstate Coordinator Prairie Dog Conservation Team, pers. comm.). Staggered activity periods among sexes and ages have been postulated as an evolutionary adaptive strategy for reducing competition for limited resources (Clark 1977).

Adult males are the first to emerge in mid-February to early March, about 2 to 3 weeks before adult females (Tileston and Lechleitner 1966, Clark 1977, Cooke 1993). After emergence of females, the breeding season begins and lasts for about 2 to 3 weeks (Bakko and Brown 1967). Pups emerge in mid- May to June at about 5 to 7 weeks of age, at which time the colony experiences a dramatic increase in above ground densities (150-400%) (Tileston and Lechleitner 1966, Clark 1977). The first week after emergence pups remain very close to their natal burrows, but by week three they become entirely independent of both their mothers and natal burrows (Clark 1977). Surface activity begins to cease for adult males in late July to mid-August and for adult females about 2 to 4 weeks later (Bakko and Nahorniak 1986). Juveniles remain active above ground until late fall.

Both male and female white-tailed prairie dogs are reproductively mature at one year of age (Cooke 1993). Females are monestrous and produce an average of 5.64 $\pm$ 0.74 embryos per litter on the basis of uterine swellings (Bakko and Brown 1967). However, mean litter size at juvenile emergence is lower. Tileston and Lechleitner (1966) found 40% of the embryos were lost in the interval from implantation to emergence. Flath (1979) found an average of 4.58 pups per litter at 7 weeks based on a sample size of seven litters. Hoogland (2001) found fewer than 4 juveniles emerging from nursery burrows in Gunnison's and Utah prairie dogs and indicated that black-tailed, Gunnison's and Utah prairie dogs reproduce slowly for five reasons--
1) survivorship is less than 60% for all three species and remains low in subsequent years,;
2) females produce a single litter per year regardless of available resources; 3) the percentage of males that copulate as yearlings is less than 50% for all three species; 4) the average probability of weaning a litter varies from 43 to 82% among the three species and 5) the mean litter size at juvenile emergence varies from 3.08 to 3.77 for all three species.

Cynomys species are known to be colonial and gregarious; however, variations in the degree of colonialism and social patterns exist among the five different species. White-tailed prairie dogs are one of the least colonial within the genus and often colonize in a sporadic pattern over the landscape. Unlike black-tailed prairie dog colonies where boundaries are normally easy to define, white-tailed prairie dog colonies are extremely difficult to characterize (Tileston and Lechleitner 1966, Forrest et. al. 1985, Mariah Associates, Inc. 1986, 1987, 1988, Bio/West Inc. 1988, Patton 1989). In addition, densities of adults and yearlings within a colony are usually significantly lower than those found in other prairie dog species (Lechleitner 1969, Clark 1977, Hoogland 1979, 1981).

Sociality is less pronounced in the white-tailed prairie dog than in the black-tailed dog and this may be due to their staggered activity periods and unpredictable environments. The social system of the white-tailed prairie dog has been classified as a single-family female kin cluster (Tileston and Lechleitner 1966, Michener 1983) comprised of several reproductive females, occasionally one or two males of reproductive age and dependent young (Cooke 1993). Females within a cluster are generally members of the same matriline (Cooke 1993). Within the cluster, white-tailed prairie dogs spend little time in social maintenance and most of their active time feeding (approximately 60%) (Tileston and Lechleitner 1966, Clark 1977, Orabona-Cerovski 1991, Grant 1995). Conversely, black-tailed prairie dogs form polygenous harems and spend much of their time in social integration (Michener 1983). Juvenile white-tailed prairie dogs are more gregarious than adults for the first few weeks after emergence, but by late summer their behavior resembles adults (Clark 1977). Overt defense of individual white-tailed prairie dog cluster territories does not occur. However, during the breeding season individual males monitor the reproductive condition of females and defend specific plots around burrows allowing only receptive females to enter for copulation (Clark 1977, Cooke 1993). Clark (1977) also found that females showed a weak defense around nest burrows just prior to the emergence of young, but adult female-pup relations terminated soon after juveniles appeared above ground (Tileston and Lechleitner 1966, Clark 1977).

Little work has been done examining home range sizes in different habitats and for different sex and age classes with regard to white-tailed prairie dogs. In southeastern Wyoming white-tailed prairie dogs home ranges ranged from 0.5 to 1.9 ha (1.2-4.7 ac) (Clark 1977) and in north-central Colorado home range sizes ranged from 1,481.1 m^2 to 2,017.2 m^2 (1,771-2,412 yd^2)(Cooke 1993). Home range sizes calculated for the Utah prairie dog were found to range from 0.5 to 1.77 ha (1.2-4.4 ac) with the size of the home range inversely related to density (Wright-Smith 1978 in McDonald 1992).

Emigration and immigration occur in early spring at the onset of the reproductive period and again in late summer and early fall as young of the year disperse (Clark 1977). At study sites near Laramie and Meeteetse, Wyoming, the percentage of immigrants into populations ranged from 0% to 50% of the total animals captured with an average of 24% for all six colonies examined (Menkens 1987). Anderson and Williams (1997) examined white-tailed prairie dog colonies near Meeteetse during a plague epizootic. After plague was no longer present in the area, colonies showed rapid increases and had high proportions of juvenile males. This led the investigators to postulate that immigration led to the rapid increase in animal numbers. Menkens (1987), Tileston and Lechleitner (1966), and Clark (1977) all have suggested that immigration and emigration can contribute greatly in some years to white-tailed prairie dog population dynamics.

Clark (1977) found that young of the year began to disperse when the population densities within colonies was greatest (late June to early July). Competition and changes in social climate during this time probably initiated dispersal. Five of the 6 dispersing young on his study grid were males and the greatest distance moved was 300 m (328 yds). The other animals moved less than 60 m (67 yds). Dispersing young usually occupied old, uninhabited burrow systems but were also able to dig new burrows. At Shirley Basin, Wyoming dispersal from natal dens did not always occur (Orabona-Cerovski 1991, Grant 1995). Orabona-Cerovski (1991) found only 1% of all males dispersed more than 200 m (218 yd) with the majority moving less than 50 m (55 yd). The majority of juvenile females also moved less than 50 m (55 yd) from their natal burrows with most individuals not moving at all. Only 3% of females moved greater than 200 m (218 yd). Grant (1995) found that none of his radio-collared juveniles dispersed from their natal areas. Two translocated animals traveled 823 m (900 yd) and 767 m (839 yd), respectively, back to their original trap location. In Montana, Flath (1979) documented a dispersal distance of 2.4 km (1.5 mi) of a single white-tailed prairie dog in the fall. In north-central Colorado, Cooke (1993) found dispersal to occur by both male and female juvenile white-tailed prairie dogs in July and August. Dispersal distances ranged from 0.4 to 2.4 km (0.14-1.44 mi) with one female dispersing 8.0 km (4.8 mi). Dispersal in the Utah prairie dog occurs mainly among juveniles with dispersal distances of up to 1.2 km (0.75 mi) (Wright-Smith 1978 in McDonald 1992).

White-tailed prairie dogs are diurnal with peak activity periods in the morning and late afternoon in the warmer summer months and in the afternoon during the cooler spring and fall months (Tileston and Lechleitner 1966). White-tailed prairie dog activity is greatest between ambient temperature of 18º C (64º F) and 28º C (82º F) (Grant 1995). Individual animals within colonies can be seen throughout the day except in inclement weather such as heavy rain, high winds, snow or hail storms.

White-tailed prairie dogs may spend up to two-thirds of their life underground in burrows (Clark et al. 1971). Burrows provide shelter from inclement weather, protection from predators, a refuge for bearing and rearing young and as hibernacula (Burns et al. 1989). A single white-tailed prairie dog may use several burrows and within active colonies, there may be unused burrows. Mounds at maternity burrows are significantly larger than at other types of burrows (Flath 1979). Burrow maintenance is generally confined to the spring when materials that collected in the burrow during the winter are removed (Clark 1977).

EVALUATION OF WHITE-TAILED PRAIRIE-DOG POPULATION STATUS BY STATE

Accurate evaluation of the range-wide population status of the white-tailed prairie dog was difficult due to the absence of historical information prior to the mid-1980s. This significantly limited our ability to document changes or project long-term trends. In addition, because agencies lack valid estimation techniques to monitor white-tailed prairie dog populations, inconsistencies in survey methods and variable time periods between surveys made analysis of range-wide trends impossible. In order to provide the most accurate assessment regarding the current status of this species, two types of data were analyzed. The first data examined were those collected at black-footed reintroduction sites. This survey information was used to index population changes at localized scales. The second data set used evaluated gross changes in occupied habitat within each State at selected sites. Both data sets have weaknesses and limitations as described below, but are the best available data for this assessment. The incorporation of both data sources provided a more complete assessment of the range-wide status of the white-tailed prairie dog by describing changes not only with regard to numbers of animals but also examining the distribution of occupied habitat across the range.

The Colorado, Montana and Utah sections were evaluated with the methods described below and were authored by Amy Seglund. The Wyoming section was written by Martin Grenier and Bob Luce.

Methods

Population Analysis

In 1981 with the discovery of black-footed ferrets at Meeteetse, Wyoming, States within the historic range of this species initiated programs to identify complexes (Appendix I) of white-tailed prairie dogs as potential reintroduction sites for black-footed ferrets (Figure 2). Because white-tailed prairie dogs and black-footed ferrets occur sympatrically, evaluation of suitable habitat for black-footed ferrets is dependent on describing white-tailed prairie dog factors such as size and spatial arrangement of colonies and densities of prairie dogs within these areas (Forrest et al. 1985, Biggins et al. 1989, 1993). To aid in evaluation of prairie dog habitat, Biggins et al. (1989, 1993) developed a technique that involved counting active burrows within 1 km x 3 m transects distributed over colonies. Transects were designed to sample the mean burrow density for an entire complex within 10% at the 95% confidence level. The number of active burrows was then converted from burrows to prairie dog counts and finally to an estimate of density. This method (Biggins et al. 1989, 1993) also attempted to define and standardize mapping of colonies and complexes. Because this method has been consistently used at black-footed ferret reintroduction sites and no other long-term monitoring data are available, the evaluation of temporal population changes of white-tailed prairie dog populations is based on surveys conducted at black-footed ferret reintroduction sites.

Concerns were raised among the White-tailed Prairie Dog Working Group members regarding the use of the black-footed ferret survey data to evaluate the status of white-tailed prairie dog populations due to the questionable correlation between counts of active burrows and densities of animals. A review of the literature found that Severson and Plumb (1998), Menkens (1987) and Powell et al. (1994) did not find a relationship between burrow density and above ground counts of either white-tailed or black-tailed prairie dogs. Similarly, Van Horne et al. (1997) did not detect a consistent relationship between burrow entrance counts and Townsend's ground squirrel (*Spermophilus townsendii*) population estimates. These authors recommended that burrow counts not be used to index population density unless first thoroughly verified. However, other studies involving ground squirrels (Owings and Borchert 1975, Nydegger and Smith 1986, Weddell 1989 *in* Van Horne et al. 1997) correlated counts of burrows with densities.

The reason for discrepancies among studies may be the result of a number of factors. One may be an observer's ability to reliably differentiate between active and inactive burrows. Biggins et al. (1989, 1993) defines active prairie dog burrows as those that have fresh fecal material detected within 0.5 m of a burrow entrance. Thus active burrow designation is not left up to the subjective judgment of an observer. The second problem that may occur when correlating burrow density with above ground counts is timing of surveys. Both ground squirrels and white-tailed prairie dogs limit above ground activity in winter, and conducting surveys too early in the year may provide an inaccurate measurement of activity. Surveys at black-footed ferret reintroduction sites using Biggins et al. (1989, 1993) are conducted at the same time each year to provide a better estimate of activity. Finally, the scale at which the surveys are conducted may affect correlation between active burrow density and population estimates. Burrow indices appear to be better suited for indexing trend over larger geographic scales and over longer time periods (Biggins 2004).

Consensus among the White-tailed Prairie Dog Work Group was that the Biggins et al. (1989, 1993) method provided the best available technique to index white-tailed prairie dog populations and that, although burrow counts may be inaccurate at producing precise population estimates of white-tailed prairie dogs, they are useful for indexing abundance of the species at the landscape scale. In addition, because the methodology uses strip transects to sample burrows, it may provide a more accurate method for sampling an unevenly distributed species such as the white-tailed prairie dog (Biggins 2003b).

When developing the Conservation Assessment, the White-tailed Prairie Dog Working Group recognized the value of standardizing reporting methods for white-tailed prairie dog survey data collected at black-footed ferret management areas in order to establish a range-wide trend for the white-tailed prairie dog. The Working Group reviewed the survey techniques based on the Biggins et al. (1989, 1993) methodology used over the past 15 years by Brent Bibles, Utah State University, in Colorado and Utah; Bob Luce, former Nongame Mammal Biologist for the Wyoming Game and Fish Department (WGFD) in Shirley in Wyoming; and Dean Biggins, USGS in Meeteetse, Wyoming. Though the Biggins et al. (1989,1993) methodology was the foundation for black-footed ferret habitat sampling completed in all three States, there were departures in both sampling methodology and analysis from the original Biggins et al. (1989, 1993) protocol (Appendix II). These departures made standardizing the data between States impossible. For this reason, the Conservation Assessment does not compare population changes on a range-wide basis, but rather presents data State-by-State.

White-tailed prairie dogs reproduce once per year and because populations have been found to fluctuate widely from year-to-year, collection of a population estimate at a single point in time may represent a low, high or average point (if one exists) in the population cycle. Thus only black-footed ferret reintroduction sites surveyed for $\geq$ 3 years were evaluated. In addition, because burrow indices appear to be better suited for indexing trend over larger geographic scales, only surveys conducted on areas greater than 1,500 ha (3,706 ac) were used in the population analysis. To evaluate the variability in population estimates calculated over time at survey sites, coefficient of variations and standard deviations were calculated. Sites used for temporal population analysis in the Conservation Assessment were: Coyote Basin (Utah and Colorado), Wolf Creek (Colorado), Kennedy Wash (Utah), Shiner Basin (Utah), Snake John (Utah), Meeteetse (Wyoming) and Shirley Basin (Wyoming) (Figure 2). Additional large complexes were mapped and surveyed but did not provide sufficient data to document trends.

These areas included Cisco (Utah) and Little Snake (Colorado). No complexes suitable for black-footed ferret reintroduction have been identified in Montana and thus no surveys were available to develop a population trend for this State.

Changes in Occupied Habitat

The geographical range of the white-tailed prairie dog has changed little since historic times; however, it is thought that occupied habitat has decreased (Knowles 2002). Quantifying the magnitude of this decline is difficult due to the lack of accurate estimates of occupied habitat prior to the introduction of plague, alteration of landscapes and implementation of eradication campaigns (Anderson et al. 1986, Knowles 2002). Even today, estimates of occupied white-tailed prairie dog habitat are not accurately quantified.

Techniques used to map white-tailed prairie dog habitat have relied on delineating colony boundaries based on burrow distribution. Because white-tailed prairie dogs exhibit a mosaic pattern of distribution with burrow densities and activity levels being extremely variable throughout a colony, boundaries are often determined using topographic features, substrate variations or the best estimate of the investigator. Thus mapping efforts can become a reflection of suitable rather than occupied habitat. In addition, individual burrow activity is not always assessed which results in both active and inactive areas included in estimates of occupied habitat. Little information is available on the length of time a burrow persists on the landscape and it is likely that the rate of deterioration varies with activity of remnant prairie dogs, other mammals (e.g., badgers, ground squirrels) and weather conditions (e.g., precipitation, wind). Biggins (2003b) examined a subset of 7 colonies at Meeteetse, Wyoming that underwent sudden, steep declines and found that burrows began to deteriorate at a rather steady rate. On 5 of the 7 colonies, no burrows were found on sample transects by year 6; no burrows were detected by year 4 on 1 of the colonies, and by year 5 on 2 others. Anecdotal evidence from locations in Colorado found burrows collapsing 6 years after a known die-off (Squires et al. 1999) and in Montana, there is evidence that siltation of vacant burrows occurs within in 1 to 3 years (Montana Prairie Dog Working Group 2002). The consequence of mapping both active and inactive areas is an overestimation of occupied habitat, with declines not accurately documented.

Because of the problems stated above, direct comparisons in the estimation of occupied habitat of white-tailed prairie dog colonies is not accurate enough to determine trends except at a gross level. Until a systematic measure of variation between mapping efforts can be developed, mapping can only provide a gross approximation of occupied white-tailed prairie dog habitat. Gross approximations are meaningful in areas that have experienced significant declines or increases, but in areas where changes have been less extreme, mapping cannot produce comparative results. Most data collection over the last 20 years has report only “occupied area,” without a density or population estimate, therefore Work Group had no other large-scale data set to use to compare past versus current white-tailed prairie dog status. It is beyond the scope of this document to include specific actions to address this situation however, the Conservation Assessment recognizes that consistency in occupied area and density estimates must be addressed in white-tailed prairie dog mapping efforts in the future.

To assess the changes in occupied habitat as accurately as possible, only areas that were mapped with similar effort and methodology were compared to evaluate State-wide trends. The bulk of historic information came from colonies and complexes that were mapped in response to specific energy project clearances as well as those mapped in the identification of potential black-footed ferret reintroduction sites. Energy clearances were conducted in response to the USFWS recommendation that inventories be completed on all projects or actions that involved white-tailed prairie dog colonies of greater than 101 ha (250 ac) or at aggregations of colonies, that combined, could support a black-footed ferret population (USFWS 1986). Recent mapping used for comparisons include Statewide efforts to locate and map occupied white-tailed prairie dog habitat as well as re-mapping of colonies at black-footed ferret reintroduction sites. The goal of the current Statewide mapping in Colorado, Montana and Utah is to develop baseline knowledge of white-tailed prairie dog occurrence for conservation planning and eventual long-term monitoring of occupied habitat.

Predicted Range Model

Typically lacking for most species is a spatially detailed, regional representation of the species' range map. With the advancement of computer-aided mapping and the accessibility of digital GIS datasets, a spatially detailed, Predicted Range Model for the white-tailed prairie dog was produced.

The first step in the development of the Predicted Range Model was to acquire pre- existing digital GIS data layers via the Internet:

Bureau of Land Management (BLM) Ownership: Bureau of Land Management. 2001. Representation of Statewide and regional land ownership of 11 western States. 1:100,000. Landholders in the dataset are Federal, State, local governments, universities, tribal and private lands.

State Boundaries: Environmental Systems Research Institute, Inc. (ESRI) Data Team. 2001. A generalized representation of the fifty U.S. States and the District of Columbia. 1:3,000,000. ESRI, Redlands, California 92373.

County Boundaries: Environmental Systems Research Institute, Inc. (ESRI) Data Team. 2001. A generalized representation of the counties of the fifty U.S. States and the District of Columbia. 1:3,000,000. ESRI, Redlands, California 92373.

Gross Range Map: Modified from Hall (1981). CDOW and the WGFD provided a more detailed and accurate description of the current white-tailed prairie-dog range. The modified CDOW map included areas in Colorado, such as the Bookcliffs and Roan Plateau, which are known not to contain white-tailed prairie dogs. The range map outer boundary identifies the external extent of the distribution and does not infer that all areas contained are suitable for white-tailed prairie dogs. The Utah portion of the range map was modified from the Utah Gap Analysis program.

Colony Data: Both current and historical colony localities were provided by the individual State agencies.

National Elevation Dataset: U.S. Geological Survey. 2000. Designed to provide national elevation data in a seamless form with a consistent datum, elevation unit (30-meter), and projection. http://gisdata.usgs.net/ned/default.asp

National Land Cover Dataset: U.S. Geological Survey. 2001. Derived from the early to mid-1990s Landsat Thematic Mapper satellite data, at a 30-meter spatial resolution, the National Land Cover Data (NLCD) is a 21-class land cover classification scheme applied consistently over the United States. http://landcover.usgs.gov/natllandcover.asp

Colorado Oil and Gas Conservation Commission (COGCC) Oil and Gas Well Spatial Data Set. 2004. A representation of more than 57,000 oil and gas well locations in Colorado.

Utah Division of Oil, Gas and Mining. State of Utah- Department of Natural Resources. 2004. Individual records of basic information for each well in the Utah Division of Oil, Gas and Mining database.

Potential Exploitable Minerals for the State of Wyoming. U.S. Bureau of Mines. 1990. Availability of Federally Owned Minerals for Exploration and Development in the Western United States. 1:500,000. A general, small-scale view of where potential exploitable minerals areas are located in the State of Wyoming. http://www.wygisc.uwyo.edu/clearinghouse/metadata/mineral.html

2000 Urbanized Areas Cartographic Boundary. 2000. U.S. Census Bureau. Consists of a densely settled territory that contains 50,000 or more people.

The second step in creating the Predicted Range Model was to process the unrelated input data layers. The individual data layers were imported into Erdas Imagine 8.6 and then projected to a common coordinate system called Albers Equal-Area map projection. This projection system is used in the United States and other countries that have a larger east-west than north-south extent, thus portraying areas over the entire map with the same proportional relationship as the actual geographic areas that they represent on Earth. The National Elevation Dataset (NED), downloaded in individual 1:250 quadrangles, was then map-joined to create one complete layer for each individual State. The National Land Cover Dataset (NLCD) was downloaded in complete State sections including a 300-meter (10 pixel) buffer added to the outer boundary. For these reasons, the NED and NLCD datasets were clipped to each corresponding State jurisdictional boundary. The final pre-processing step was to derive percent slope from the NED dataset using the algorithm incorporated into Erdas Imagine 8.6.

The third step in producing the Predicted Range Model was to separate specific habitat associations from those considered as non-appropriate habitat. These associations were based on the scientific literature and known species occurrences. We selected three input data layers as indicators of potentially appropriate white-tailed prairie dog habitat. These data layers included an elevation range between 1,150 m (3,773 ft) and 3,050 m (10,006 ft), 0 to 20% slope and two generalized land cover classes, specifically called Grasslands and Shrublands (Table 2). Land cover characteristics that were removed from the Predicted Range Model were classes in the NLCD dataset called Water, Developed, Barren, Forest, Non-Natural Woody, Agriculture and Wetlands (Table 2).

The fourth step was to calculate the actual Predicted Range Model. This was accomplished by using the additive overlay technique in which each data layer is added together as an equally weighted component in the model. Although the process is referred to as an additive approach, the calculations produce only a combination of the important variables, removing any areas not fitting the appropriate criteria. A model was calculated for each individual State and then assembled together to form one complete, seamless dataset. An additional filter, which eliminates isolated patches of pixels smaller than 202 ha (500 ac), was performed. This function was used based on the assumption that small, isolated pixels may not provide appropriate habitat for the white-tailed prairie dog. Finally, the large mosaic was clipped to the gross range boundary, creating the outer extent of the Predicted Range Model. The gross range map was produced by acquiring State-specific range information from the State wildlife agencies and then editing and edge matching the specific range maps at State boundaries to portray a smooth, continuous range boundary. The gross range boundary identifies the outer extent of the white-tailed prairie dog range. Within the boundary areas exist that do not provide, nor have ever provided suitable white-tailed prairie dog habitat. The hectares within the Predicted Range Model were then calculated in Erdas 8.6. The gross range boundary, along with the additional data layers, such as the landownership, census data, and oil and gas well locations were used to facilitate analysis for the risk assessment. It is important to note these calculations were accomplished using a combination of Erdas 8.6 and ArcGIS 8.3 software. The use of other software or different map projections may result in a slight difference in hectare estimates.

The Predicted Range Model was produced as a more accurate, spatial depiction of the potential range of the white-tailed prairie dog. The main constraint of the model is the availability of pre-existing GIS data layers at the regional scale. Although the NLCD dataset provided a consistent, region-wide land cover data layer, it depicted only general land cover associations. The NLCD does not contain information associated with shrub density, shrub height or shrub species; and current, detailed land cover information, along with a data layer depicting detailed soil characteristics, are not available in a digital, GIS format. Thus the Predicted Range Model overestimates suitable habitat for the white-tailed prairie dog due to critical indicators of white-tailed prairie dog occupation that the model cannot address. Additionally, the data layer was created from 30-meter Landsat Thematic Mapper (TM) data captured between 1991 and 1993, which limits our ability to evaluate current landscape characteristics. Given these constraints, this model was developed as a first-cut guide to help locate appropriate areas for more intensive on the ground field surveys or used to identify habitat connections and corridors. This model is not meant to imply the entire area could be or is appropriate for white-tailed prairie dog occupation.

Colorado

Historic Information

The U.S. Department of Agriculture (1911) provided the following description of white-tailed prairie dog occupied range and economic concerns of this species in Colorado:

> "The white-tailed prairie dog replaces the Gunnison's and black-tailed prairie dog on the sage plains of northwestern Colorado, where it occupies much of the open country west of the Park and Gore Range and north of the Lower Gunnison Valley. It occurs also in North Park, but was not found in the Laramie Valley, east of the Medicine Bow Range, nor does it range across the Rabbit Ear Mountains into Middle Park and Blue River Valley. In the Snake River Valley it is found east to Honnold, and in White River Valley it is common as far up as the mouth of the South Fork. Prairie dogs occur throughout the Bear River Region, and follow this stream to its headwaters in Egeria Park, thence, sparingly, south across the divide to McCoy and Grand River, and again across Piney Divide to Wolcott, on Eagle River, and West in the Grand Valley to Gypsum. They do not extend through the Grand Canyon above Glenwood, nor do they pass around it, and they are absent from the Grand valley between Glenwood and Grand Junction. On the desert areas between Grand Junction and the Utah boundary, prairie dogs are common, doubtless coming in from the west, where the range is probably continuous around the western end of the Bookcliffs in Utah. They range from Axial Basin south across the lowest passes of the Danforth Hills to the White River Valley at Meeker, but apparently do not cross the White River Plateau or its western extension, the Book Plateau, at any point in the State.
>
> Instead of extending northeast from Grand Junction in the narrow Grand Valley, *C. leucurus* ranges to the southeast in the broad Gunnison and Uncompahgre Valleys, and occurs over a wide area between the Grand Mesa and Uncompahgre Plateau. In the Uncompahgre Valley it was noted south to a point on Dallas Creek, a few miles west of Ridgeway. East of Montrose it was abundant along the railroad at Cedar Creek, and a few were seen almost to the summit of Cerro Ridge, between Cedar Creek and Cimarron. None were observed at Cimarron, and the divide between the Cimarron and Uncompahgre Rivers appears to mark the eastern limit of the range in this region. The species extends east along the North Fork of the Gunnison to Hotchkiss and Paonia, and was abundant at the west base of the West Elk Mountains, between Hotchkiss and Crawford. The majority observed in this section were on dry adobe flats, where the only vegetation worthy of mention was the prostrate, scrubby, desert-growing *Atriplex nuttallii* and a sparse *Dondia* in damp alkaline spots.
>
> Wherever white-tailed prairie dogs live in the neighborhood of cultivated ground they are very injurious to green crops. In the vicinity of Grand Junction the burrows are usually in the dry banks of irrigating ditches, and the prairie dogs inflict considerable damage on the adjacent truck farms by eating cabbages, cantaloupes, and other crops. They destroy considerable areas of range grasses and feed extensively in alfalfa fields and hay meadows in the river valleys throughout their range."

The approximate range of the white-tailed prairie dog in the northwestern portion of the State was also documented in 1910 by a scientific trip conducted by the University of Colorado (Ramaley 1910). This scientific expedition documented numerous white-tailed prairie dog colonies between Rifle and Meeker, noted them to be common locally from Meeker to Axial and along Little Beaver Creek, and found a few scattered colonies remaining from Meeker up to White River to a point just below Buford where the last white-tailed prairie dogs were seen.

Monitoring Efforts

The majority of surveys and mapping of white-tailed prairie dog colonies has occurred within the boundary of the BLM's White River Resource Area. This area comprises much of Rio Blanco County, the southern portion of Moffat County below the Little Snake Resource Area and the northern section of Garfield County. It extends west to the Utah border and east to the White River National Forest. Approximately 24,282 ha (60,000 ac) of white-tailed prairie dog occupied habitat was thought to be distributed more or less continuously north of the White River from Pinyon Ridge west along US State Highway 40 corridor to Utah, south through Coal Oil Basin and Coyote Basin. Since the earliest surveys, white-tailed prairie dog populations in the White River Resource Area have been unpredictable with often rapid fluctuations in both abundance and distribution. Biologists believe that these fluctuations have been driven primarily by disease and to a lesser extent changes in the composition and structure of plant communities due to grazing, resource extraction and fire suppression (Wolf Creek Work Group 2001).

Gilbert (1977) surveyed for active white-tailed prairie dog colonies on approximately 97,000 ha (239,683 ac) in the west-central part of the White River Resource Area. Colonies were mapped on USGS topographic maps (1:24,000) and occupied habitat was calculated by hand. Eighty-two colonies encompassing 10,843 ha (26,792 ac) were mapped. Colony size averaged 132 ha (326 ac) with the largest being 3,350 ha (8,277 ac). Sixty-eight percent of the colonies were located on BLM lands, 28% on private lands, and 4% on State lands. Twenty-one belt transects (500 m x 5 m) were completed in 14 colonies to sample burrow density as an index to activity. The mean density of active burrows in colonies sampled was 68 per ha (27 per ac) with the number of active burrows exceeding inactive burrows in all but one of the colonies transected. Transecting was prematurely halted when Gilbert noted evidence of a possible plague epizootic within the study area.

A number of surveys were conducted in the White River Resource Area in the 1980s. Almost all of the surveys found that white-tailed prairie dogs began to decline around 1985 with subsequent increases in white-tailed prairie dog numbers by 1988. A summary of these surveys are described below.

A decrease in white-tailed prairie dog numbers was documented around Blue Mountain and Massadona during a long-term prey availability study conducted as part of a ferruginous hawk nesting mitigation study in Moffat and Rio Blanco counties (Stalmaster 1985, 1988). White-tailed prairie dogs densities were estimated annually by walking or driving established transects in April and June from 1982 to 1988 and counting the number of white-tailed prairie dogs seen along transects. The white-tailed prairie dog numbers observed along transects declined significantly from a high of 119 prairie dogs per km^2 (309 per mi^2) in 1983 to extreme lows of 8 and 9 prairie dogs per km^2 (20.8 and 23.4 mi^2) in 1986 and 1987, respectively. By 1988, white-tailed prairie dog densities appeared to be improving with 52 prairie dogs per km^2 (135 per mi^2).

A decline in occupied habitat of white-tailed prairie dogs in the mid-1980s was also demonstrated during a pre-construction ecological study completed along a proposed route for the Craig-Bonanza transmission line in Utah and Colorado in 1988 (Bio/West Inc. 1988). The survey was conducted to determine amount of occupied habitat and activity status of white-tailed prairie dog colonies in an area extending from Bonanza, Utah north towards Dinosaur, Colorado, and then east along US State Highway 40 to Maybell, Colorado. A preliminary helicopter survey conducted in 1987 identified 30 colonies encompassing 6,102 ha (15,080 ac) of which 6 were active on 2,072 ha (5,120 ac) (Department of Energy 1987). In the 1988 ground surveys, 28 of the previous 30 colonies were verified and an additional 7 colonies were mapped. All 35 colonies located were active and total occupied habitat mapped in 1988 was 4,540 ha (11,218 ac). These surveys again indicated that white-tailed prairie dog populations in the White River Resource Area declined in the mid-1980s, but by 1988 were beginning to rebound.

Chevron Oil Company conducted mapping surveys of white-tailed prairie dog colonies within Coal Oil Basin from 1985 to 1988 (Mariah Associates, Inc. 1986, 1987, 1988). Coal Oil Basin is comprised of Colorado’s largest oil field, the Rangely oil field (12,141 ha [30,000 ac]). The Rangely oil field was first explored in 1933, and was fully developed with 478 wells at 16 ha (40 ac) spacing by 1949. Beginning in 1963, Chevron began infill drilling and by 1984, a majority of the field had been drilled at 8 ha (20 ac) spacing. Since 1991 no new wells have been drilled, but considerable maintenance activity remains and in 2001, a limited-scale 3-D seismic effort was undertaken. Surveys within this area from 1985 to1988 mapped 2,446 ha (6,044 ac) of occupied habitat with little apparent difference in occupancy between years. Burrow densities however were not estimated. In 1988, the survey team found three white-tailed prairie dog carcasses in a curled-up position near burrow entrances with no apparent external injuries, possibly implying the presence of plague. White-tailed prairie dog populations appeared to maintain themselves throughout Coal Oil Basin from the mid- to late 1980s whereas other areas within the White River Resource Area declined. Relative to other occupied white-tailed prairie dog habitats in the White River Resource Area, Coal Oil Basin supports the most consistently abundant white-tailed prairie dog population (E. Hollowed, BLM, pers. comm.).

In 1985, lands exhibiting past and present occupation of white-tailed prairie dogs were mapped by White River Field Office in Meeker (E. Hollowed, BLM, pers. comm.). These surveys indicated that about 16,000 ha (39,536 ac) of occupied habitat occurred in an area roughly described as west of Pinyon Ridge, south of US State Highway 40, and north and east of US State Highway 64 in Moffat and Rio Blanco counties. In 1985 a presumed plague epizootic severely reduced (>75%) prairie dog abundance in Divide Creek, Wolf Creek and Coal Creek Drainages (CDOW 1986).

One additional area was surveyed in the 1980s, but it was surveyed one time and no data on trends were reported. The surveys occurred at 2 Known Recoverable Coal Resource Areas near Rangely Colorado. The areas were surveyed for white-tailed prairie dogs in 1981 in response to prospective coal leasing activity by the BLM (McDonal et al. 1981). During the surveys, 14 white-tailed prairie dogs colonies covering 3,621 ha (8,947 ac) were mapped, with private and State land holdings comprising < 28% of the prairie dog occupied area.

Population Analysis

Within the State of Colorado three areas were evaluated as to their potential as black-footed ferret reintroduction sites. These areas included Coyote Basin, Little Snake and Wolf Creek (Figure 2). All three sites are located in northwestern Colorado in Rio Blanco and Moffat Counties. The Little Snake Black-footed Ferret Management Area is located within the BLM's Little Snake Resource Area and both Wolf Creek and Coyote Basin are located within the BLM's White River Resource Area. Wolf Creek and the Colorado portion of Coyote Basin were selected to serve as black-footed ferret reintroduction sites and reintroduction was approved in the Record of Decision for the White River Resource Area Management Plan, July 1997 (Wolf Creek Work Group 2001). Selection of the two areas was due to favorable land use practices, landownership pattern and suitability of white-tailed prairie dog resources. Population data were examined for Wolf Creek and Coyote Basin. The Little Snake Black-footed Ferret Management Area could not be evaluated due to lack of survey data but it is included in the change in occupied habitat analysis.

Wolf Creek -- The Wolf Creek Management Area lies predominantly in southwestern Moffat County, about 18 miles northeast of Rangely with about 10% of the Management Area in Rio Blanco County; US State Highway 40 crosses the northern portion of the Management Area between Massadona and Elk Springs (Figure 2). Comprised primarily of Federal land, this 33 km^2 (81 mi^2) Management Area encompasses nearly one-half of the white-tailed prairie dog habitat found on BLM lands within the White River Resource Area (Wolf Creek Work Group 2001).

The first white-tailed prairie dog mapping of the Wolf Creek Management Area was completed in 1989. Both active and inactive colonies were delineated on topographic maps by an observer scanning colonies from an elevated vantage point. Remapping of the area in 1993 excluded areas of inactivity thus a decline in mapped occupied habitat resulted (Table 3).

Surveys within the Wolf Creek Management Area have been inconsistent: in 1993/94, surveys were conducted in an area from Pinyon Ridge on the east to Deserado Mine road on the west; in 2000 only the west side of the mapped area between Pinyon Ridge on the east and Coal Ridge road on the west was transected (colonies 1-13); and in 2001, the east side of this area was transected (colonies 14-26) (L. Renner, CDOW; B. Bibles, Utah State University, pers. comm.). The 2002 and 2003 surveys were the first time that the entire mapped area was transected with the CDOW transecting the east end and Utah State University and the BLM transecting the west. Because of the discrepancies in data collection and protocol within the Management Area, data collected on the west and east sides are presented separately to describe population changes.

In Wolf Creek, like other areas within the White River Resource Area, plague appeared to negatively impact the Management Area beginning on the east side in 1985 and progressing west to eventually affect the entire area (L. Renner, CDOW, pers. comm.). Populations began to increase in the early 1990s and by 1993/94 they were thought to be near pre-plague levels (L. Renner, CDOW, pers. comm.). Survey data from the east side of Wolf Creek showed a relatively stable population from 2001 to 2003 with a coefficient of variation of 14% (Tables 3 and 4; Figure 3). The white-tailed prairie dog population on the west side of Wolf Creek however, declined significantly after the 2000 surveys and has not recovered to pre-decline levels (Table 3; Figure 3). This population showed a high measure of variability with a coefficient of variation of 55% (Table 4).

Coyote Basin--The Coyote Basin Management Area encompasses about 4 km^2 (10 mi^2) in extreme western Rio Blanco County and is located about 11 miles west-northwest of Rangely (Figure 2). This site is contiguous with the Coyote Basin Black-footed Ferret Management Area in Utah and was selected as a logical expansion site for the Utah-Colorado Basin reintroduced black-footed ferret population. Colorado, Utah and Wyoming share the same black-footed ferret experimental population area, but unique management plans were developed for Colorado and Utah. Coyote Basin, Utah was chosen to receive the first black-footed ferrets under this program. The Coyote Basin Management Area in Colorado was intensively surveyed in 1997 and from 1999 to 2003.

Despite the short-term of monitoring (6 years) in Coyote Basin, white-tailed prairie dog populations showed a relatively high level of dispersion in population estimates with a coefficient of variation of 49.7% (Tables 4 and 5; Figure 3). The Coyote Basin Management Area saw a doubling in prairie dog abundance between 1997 when the population estimate for the Management Area was 3,132 and 2000 when the prairie dog population estimate was 6,666. Beginning in 2001, prairie dog populations began to decline in Coyote Basin with a decrease in numbers of white-tailed prairie dogs to 1,055 during the 2003 surveys.

Changes in Occupied Habitat

The Little Snake Management Area is located in Moffat County and is bounded on the north by the Colorado-Wyoming State line and on the south by Colorado US State Highway 318 (Figure 2). This Management Area encompasses approximately 251,885 ha (548,270 ac) and is located within the BLM’s Little Snake Resource Area. Federal land represents 88% of the Management Area, 8% is State land and 4% is private land.

Standardized prairie dog sampling (Biggins et al. 1989, 1993) was used to delineate 31,506 ha (77,851 ac) of occupied white-tailed prairie dog habitat within the Management Area in 1989 (Patton 1989). The Little Snake Management Area straddles the Colorado-Wyoming Border and the Wyoming portion of the complex supported an additional 7,215 ha (17,828 ac) of occupied white-tailed prairie dog habitat. However in both 1989 and 1990, greater than 50% of the Wyoming portion was either inactive or contained very low densities of white-tailed prairie dogs (B. Luce, Interstate Coordinator Prairie Dog Conservation Team, pers. comm.). In 1989, occupied habitat for both the Wyoming and Colorado portion of the Little Snake Management Area consisted of 38,721 ha (95,678 ac).

Mapping of the Colorado section of the Little Snake Management Area in 1989 identified two complexes: 1) the Hiawatha- Powder Wash complex (complex A) comprising 98% of the mapped hectares lying largely between the Little Snake River on the east and the Cold Spring Mountain-Middle Mountain highlands to the west and 2) a much smaller complex located just south of Irish canyon near Dinosaur National Monument (complex B) (Patton 1989). Complex A contained 276 colonies on 31,000 ha (76,601 ac) and complex B consisted of 14 colonies on 506 ha (1,250 ac). Approximately 7% of the area mapped in 1989 was inactive due to some colonies recovering from a possible disease outbreak first suspected in 1983 when dramatic population declines were recognized by BLM biologists.

In 1990, black-footed ferret habitat surveys were conducted on 24,220 ha (59,847 ac) of complex A (Hyde 1990). For ease of mapping, complex A was divided into four sub-complexes: A1 (Little Snake) = 46 colonies on 5,262 ha (13,002 ac); A2 (Vermillion) = 91 colonies on 7,843 ha (19,380 ac); A3 (Powder Wash) = 18 colonies on 4,010 ha (9,909 ac); and A4 (Hiawatha) = 71 colonies on 8,942 ha (22,095 ac). Hectares sampled within each sub-complex varied: A1 = 34 colonies totaling 4,642 ha (11,470 ac); A2 = 66 colonies totaling 7,395 ha (18,272 ac); A3 = 14 colonies totaling 3,787 ha (9,357 ac); and A4 = 44 colonies totaling 8,397 ha (20,748 ac). Complex B was not surveyed. Thirteen of the 158 colonies sampled met the minimum criteria for good black-footed ferret habitat having at least 25 active burrows per ha (10 per ac). The white-tailed prairie dog population estimate for the four sub-complexes combined was 14,381.

In 1993 and 1994, black-footed ferret habitat surveys were conducted within the 4 sub-complexes of complex A to further examine population trends and distribution of white-tailed prairie dogs (Albee 1993, Albee and Savage 1994). In 1993 a total of 360 transects were completed on 115 white-tailed prairie dog colonies covering 14,824 ha (36,629 ac) (47% of the complex). Thirty-eight of the 115 colonies or 9,129 ha (22,557 ac) met the minimum criteria of good black-footed ferret habitat (29% of the complex). The 1993 surveys showed shifts in white-tailed prairie dog activity from the 1990 surveys. For example, sub-complexes that had the highest numbers of white-tailed prairie dogs in 1990 had reduced activity in 1993, and other sub-complexes that had low numbers of animals in 1990 had increased levels in 1993.

In 1994, only colonies that had densities of equal to or greater than 763 white-tailed prairie dogs recorded in 1993 were sampled (Albee and Savage 1994). A total of 218 transects were completed on 32 colonies covering 7,088 ha (17,514 ac) (22% of the complex). Thirteen of the 32 colonies comprising 3,403 ha (8,408 ac) (11% of the complex) met the minimum requirement for good black-footed ferret habitat. Again, significant changes in activity were noticed with the most active colonies in 1993 almost completely devoid of activity in 1994, and colonies having little activity in 1993 appearing active.

The Center for Disease Control in Fort Collins, Colorado confirmed plague in the Little Snake Management Area from flea samples collected in 1994 and from coyote blood samples in 1995 (Albee and Savage 1994, USFWS et al. 1995). White-tailed prairie dog populations throughout the Little Snake Management Area were severely impacted by plague and virtually disappeared after the 1994 surveys. Because of this, the area was dropped from consideration as a reintroduction site and surveys were discontinued until populations could recover to their pre-plague levels.

In 1999, occupied habitat in sub-complexes A1 and A3 was remapped and transected to evaluate recovery rates and black-footed ferret habitat potential (Squires 1999). This remapping resulted in identification of 41 colonies covering 735 ha (1,816 ac); a decline of 92% in occupied habitat from 1990 when sub-complexes A1 and A3 contained 64 colonies on 9,272 ha (20,827 ac) (Figure 4). Area of good black-footed ferret habitat in 1999 was 465 ha (1,148 ac) with an estimated white-tailed prairie dog population of 5,064 (10.3-11.6 white-tailed prairie dogs per ha [4.2-4.69 per ac]). Most of the burrows outside of the areas mapped as active revealed signs of collapse indicating that they had not been occupied since the 1994 population decline.

In 2002, the active colonies in sub-complexes A1 and A3 were remapped and white-tailed prairie dog activity in other sub-complexes was informally assessed. From this effort there appeared to be little change from the 1999 survey and what changes did occur were largely negative (Renner 2002). In 2003, white-tailed prairie dog colonies in sub-complexes A2 and A4 were remapped and other areas informally assessed (Renner 2003). The 2003 survey showed modest improvement over the 2002 surveys however, there was concern that this observed recovery may not continue due to the continued drought conditions causing significant amounts of sagebrush and saltbush to become dormant or die over large portions of the area (Renner 2003). The areas surveyed had virtually no forb or grass cover forcing prairie dogs to subsist on underground roots. This lack of plant growth may ultimately decrease winter survival and subsequent reproductive rates.

Current Occupancy

In 2002, the CDOW embarked on a Statewide effort to document occupied white-tailed prairie dog habitat by interviewing field personnel from CDOW, the USFWS and the BLM (CDOW 2003). White-tailed prairie dog colonies were mapped on 1:50,000 USGS county sheets and were designated as active (known to have white-tailed prairie dogs inhabiting the colony within the last 3 years) or as unknown (white-tailed prairie dogs were known to occur historically, but current status was unknown). From this mapping, a total of 77,648 ha (191,866 ac) of active and 19,021 ha (47,001 ac) of unknown white-tailed prairie dog colonies were documented. These data are preliminary and represent only those colonies and areas identified by agency personnel. Field verification of identified colonies is planned and budgeted for spring 2005.

Predicted Range Model

Twenty-one percent of the white-tailed prairie dog gross range and 11% of the white-tailed prairie dog predicted range occurs in Colorado (Table 1, Figure 5). The gross range boundary overestimates percent of habitat in Colorado as it includes large areas within it that are not, nor have ever been suitable habitat for white-tailed prairie dogs. Six percent of the white-tailed prairie dog gross range in Colorado is located on agricultural lands and 0.2% it is located in urban areas (Tables 6 and 7). Forty-two percent of the gross range and 37% of the predicted range is located on private land within the State (Table 8). Colorado currently maintains 9,952 oil wells within the white-tailed prairie dog gross range and 4,953 in the predicted range.

Limiting Factors

Disease -- The significant fluctuations in white-tailed prairie dog numbers recorded for Wolf Creek and Coyote Basin Management Areas may be due to plague or other diseases such as tularemia. Since evaluation of the areas began, populations in Coyote Basin and Wolf Creek west have shown fluctuations in white-tailed prairie dogs numbers (Table 4). These fluctuations may stem from plague infiltrating these areas and infecting populations as soon as densities of white-tailed prairie dogs become sufficient to increase transmission rates and spread the disease. Disease monitoring has not taken place at either location and thus it is unknown if plague is the culprit for the dynamic nature of these white-tailed prairie dog populations.

The Little Snake Management Area was the first area to be selected as a black-footed ferret reintroduction site in Colorado. However a dramatic die-off of white-tailed prairie dogs in 1994 precluded the area from further consideration. Nine years after a plague epizootic was first documented, white-tailed prairie dog numbers and occupied habitat within the Little Snake Management Area remain severely depressed. Why this area has been unable to recover is unknown.

Human disturbance-- Historic rodent control was significant in the White River Resource Area, but in the last 25 years, little if any poisoning of either white-tailed prairie dogs or ground squirrels has taken place (USFWS et al. 2001). Rodent control on BLM lands in Moffat County has not been authorized since 1975, and large scale eradication of white-tailed prairie dogs through poisoning no longer occurs (USFWS et al. 1995).

A majority of lands in the White River Resource Area have been classified as valuable for oil and gas, though most of the development within the last 20 years has been outside of the Wolf Creek and Coyote Basin Management Areas (USFWS et al. 2001). Oil and gas developments occur in the northern portion of the Little Snake Resource Area with the two primary fields located in the Hiawatha and Powder Wash sub-complexes. Both of these sub-complexes have high densities of oil wells (USFWS et al. 1995).

Winter and spring sheep and cattle grazing occur in all 3 Black-footed Ferret Management Areas. Stocking rates and timing of grazing were historically sufficient to deplete availability of cool season grasses and increase encroachment of shrub cover. However today, the BLM attempts to manage grazing with the objective of providing sufficient rest during the critical growing season to allow for reproduction and replenishment of plant reserves (E. Hollowed, BLM, pers. comm.).

Shooting remains popular in the White River Resource Area though the number of shooters and white-tailed prairie dogs harvested each year is not adequately monitored to evaluate the effects of shooting on viability of populations. Shooting of white-tailed prairie dogs has been documented to occur in the Little Snake Resource Area but is not considered to be widespread (USFWS et al. 1995).

Anthropogenic disturbances in northwestern Colorado do not appear to occur at high enough levels to cause significant declines in white-tailed prairie dog populations, but these disturbances may act in conjunction with disease epizootics resulting in amplification of population declines and delayed recovery of white-tailed prairie dog populations.

Montana

Montana is the northern extent of the white-tailed prairie dog's range, where it historically inhabited shrub-grassland habitats in the intermountain valleys between the Beartooth and Pryor Mountain Ranges in the south central portion of the State (Hollister 1916, Flath 1979). No pre-settlement records concerning distribution and abundance exist for the State, but anecdotal information from the 20th century indicated white-tailed prairie dogs were restricted to a triangular area bounded by Bridger, Crooked Creek and Robertson Draw (Montana Prairie Dog Working Group 2002).

Today, white-tailed prairie dog colonies in Montana are small and isolated with few opportunities for widespread expansion and immigration between colonies. Because of this, the area has not been considered suitable habitat for black-footed ferret reintroduction. Information regarding population status of the white-tailed prairie dog in the State is based on a comparison of spatial mapping data from "historic" mapped colonies to maps of occupied habitat within the same areas in 2003.

<u>Changes in Occupied Habitat</u>

During the past century, a decline in numbers of white-tailed prairie dogs and a contraction in occupied habitat have been observed (Flath 1979). Between 1975 and 1977, 15 white-tailed prairie dog colonies totaling 280 ha (692 ac) were mapped in southern Carbon County (Flath 1979) (Table 9, Figure 6). After revisiting 14 of the 15 colonies in 1997, Flath found only 2 colonies comprising 39 ha (96 ac) remaining. Two additional small, previously unmapped colonies were located in 1999, increasing white-tailed prairie dogs occupied habitat in the State to 41 ha (101 ac) (Montana Prairie Dog Working Group 2002).

In 2003, 22 known white-tailed prairie dog colonies were revisited and 6 active colonies were mapped. Since 1999, little change in the total amount of white-tailed prairie occupied habitat was documented. The 2003 mapping identified approximately 48 ha (119 ac) of white-tailed prairie dog habitat in 6 colonies (C. Knowles, Fauna West Consulting, pers. comm.) (Table 9). Thus from 1975 to 2003, known occupied habitat in Montana has declined by 83%. Ongoing surveys are being conducted in Montana to locate additional white-tailed prairie dog occupied habitat where historic populations existed.

Currently the BLM, Montana Natural Heritage Program and Fauna West Consulting are conducting aerial surveys throughout the white-tailed prairie dog range in Montana to identify additional colonies. Much of the white-tailed prairie dog occupied habitat in Montana is located on private lands. All colonies mapped in 2003 were located on public lands, adjacent to roadways, and thus may not accurately represent the total occupied habitat for the State. If new colonies can be located, each will be evaluated for its conservation potential based on land ownership, habitat, topography, estimated population and proximity to other colonies.

The current observed decline of the white-tailed prairie dog in Montana during this century represents a range contraction for the species and risk of extirpation in the short-term is high. In an attempt to maintain the viability of the white-tailed prairie dog in Montana, the BLM and Montana Fish Wildlife and Parks prepared a draft environmental assessment, as documented in the Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana, proposing reintroduction of white-tailed prairie dogs to formerly occupied sites (Montana Prairie Dog Working Group 2002). A successful reintroduction could ensure continued existence of the white-tailed prairie dog in the most northern portion of its natural range and would help meet the mandate of Section 87-5-103(1), Montana Codes Annotated, which states in part, that nongame wildlife species should be "perpetuated as members of ecosystems."

The initial target for reintroduction efforts is to translocate approximately 60 to 350 white-tailed prairie dogs into 1 to 5 release sites. Adjustments to this target will be made depending on white-tailed prairie dog catch rates, success of translocations and time required for monitoring. Records of number, sex, age, and location of all captures and releases will be maintained to facilitate monitoring and active white-tailed prairie dog occupied habitat resulting from translocations will be mapped annually for at least 3 years with subsequent mapping completed at 2 to5 year intervals. Colonies on private lands will only be augmented with landowner permission.

Two actions will precede the translocation of white-tailed prairie dogs in Montana. First, a public comment period on the proposed Translocation Protocol ARM rule, as prepared by the Montana Prairie Dog Working Group, needs to be completed. In July these comments will be reviewed by the Montana Fish, Wildlife and Parks Commission and Montana Fish, Wildlife and Parks staff prior to final approval and adoption of the rule. In addition, an exemption to the recently enacted Federal ban on the movement of prairie dogs (in response to the presence of Monkey Pox in prairie dogs associated with the pet trade) will need to be obtained. The second action is the reassessment of white-tailed prairie dog donor populations and colonies identified in 2002 as potential release sites. Source white-tailed prairie dog colonies were originally identified north of Greybull, Wyoming and near Chance Bridge, Montana. However, since the reintroduction effort was initially planned, many, if not all, of the potential source populations in Wyoming and Montana may have suffered significant declines and may now be considered unsuitable as donor populations. In addition, recent changes in habitat at proposed release sites may require reconsideration and/or mitigation. Efforts are currently underway to identify new donor populations and additional reintroduction sites at some of the historically successful white-tailed prairie dog colonies in Montana.

Predicted Range Model

Montana represents 0.9% of both the gross and predicted range of the white-tailed prairie dog (Table 1). Agricultural lands impact 7% of the gross range within Montana and 0% of the gross range is being impacted by urban development (Table 6 and 7). Forty-seven percent of the gross range and 49% of the predicted range in Montana occurs on private lands (Table 10). With the possible exception of a single colony, urban and oil and gas development are not currently threatening habitats within the predicted range of the white-tailed prairie dog in Montana.

Limiting Factors

Disease, historic eradication efforts and conversion of shrub/grassland habitats to agriculture were most likely causes for the decline of white-tailed prairie dog populations in Montana. In one of the currently occupied colonies, highway traffic may pose some risk to the local population. On one colony where plague was suspected, sagebrush plants were found growing in silted-in mouths of old burrows during a 1997 survey. Of the three plants collected, one was 5 years old and two were 4 years old. This evidence implies that burrows were silted in, to the point of providing a suitable seed bed for sagebrush, as early as 1992. Considering soil type and precipitation in this area, it is logical to assume that siltation of vacant burrows would take place in 1 to 3 years. Therefore, white-tailed prairie dog colonies may have been impacted by plague as early as 1989 to 1991 (Montana Prairie Dog Working Group 2002).

Utah

Monitoring Efforts

A Statewide evaluation of the distribution and population status of white-tailed prairie dogs in Utah is confounded by a history of incomplete and inconsistent surveys, and variable time periods between estimates at specific sites. The only comprehensive effort to quantify prairie dog distribution was conducted by Utah Division of Wildlife Resources (UDWR) in 2002 to 2003. Previous efforts to account for the Statewide distribution of white-tailed prairie dogs were incomplete. Therefore, trends in occupied habitat of white-tailed prairie dogs in Utah over time must be inferred from evaluation of quantitative data collected on a limited number of sites. In addition, white-tailed prairie dog colonies occur on private lands, and trespass restrictions prevent foot access for field surveys. Consequently, the data presented below represent minimum estimates of both white-tailed prairie dog distribution and abundance.

The first concerted effort to document prairie dog distribution and abundance throughout Utah occurred in 1968 when the Division of Wildlife, Bureau of Sport Fisheries and Wildlife (later renamed the UDWR) compiled a map of Utah, Gunnison's and white-tailed prairie dog colonies using knowledge from professional biologists throughout the State (Bureau of Sport Fisheries and Wildlife 1968). The effort produced a rough map of white-tailed prairie dog distribution, but did not attempt to quantify occupied habitat by each species. This collaboration identified both the Uintah Basin in northeastern Utah and Castle Valley in eastern Utah (south of Price and west and east of US State Highway 10) as areas supporting the greatest amount of white-tailed prairie dog occupied habitat. In far eastern Utah, the Cisco Desert along Interstate 70, and Rich County near Evanston, Wyoming, were thought to contain the lowest concentrations of white-tailed prairie dogs.

The next major effort to document white-tailed prairie dog distribution and abundance in Utah occurred in 1985 (Boschen 1986, Cedar Creek Associates 1986). Since 1985, State and Federal agencies, and occasionally private consultants, have sporadically surveyed portions of the species' range. In addition to surveys to document occupied habitat, a handful of white-tailed prairie dog sites have been intensively monitored to evaluate their suitability as black-footed ferret habitat.

Population Analysis

Surveys of white-tailed prairie dog populations have been conducted at 4 Black-footed Ferret Management Areas in the Uintah Basin of northeastern Utah from 1997 to 2003 (Table 11; Figure 2). Although white-tailed prairie dog density in the Cisco Desert complex in southeastern Utah was also monitored, differences in survey protocols prevent meaningful assessment of population changes. The Cisco Desert complex is discussed in the change in occupied habitat analysis.

Coyote Basin, Kennedy Wash and Snake John are all sub-complexes located within the larger Wolf Creek/Coyote Basin complex. Coyote Basin (release site for black-footed ferret) is located south of Snake John along the Utah-Colorado border; Kennedy Wash is located northwest of Coyote Basin; and Snake John is located along the Utah-Colorado border along US State Highway 40 east of Jensen (Figure 2). Shiner Basin is located northeast of Vernal and south of Diamond Mountain (Figure 2). Within these 4 Black-footed Ferret Management Areas, white-tailed prairie dog colonies were mapped, evaluated as to their potential as black-footed ferret reintroduction sites and monitored annually to track continued habitat suitability for black-footed ferrets (Biggins et al. 1989, 1993).

Coyote Basin-- Little was known about the Coyote Basin sub-complex before initiation of black-footed ferret habitat surveys, but it was thought that a die-off had occurred here in 1990 (Boschen 1993). Windshield surveys from 1992 to 1993 showed an increase in white-tailed prairie dog numbers throughout the sub-complex (Boschen 1993). Intensive black-footed ferret habitat surveys (Biggins et al. 1989, 1993) were conducted in Coyote Basin from 1997 to 2003 (Table 11; Figure 7). Surveys from 1997 to 2000 showed the Coyote Basin population declining slightly. In 2001, the population began to increase and in 2002, the population of white-tailed prairie dogs was the highest recorded since transecting began in 1997. Subsequent surveys in 2003 showed a significant decline in the number of white-tailed prairie dogs. The coefficient of variation for Coyote Basin was 33% (Table 12).

Kennedy Wash-- From 1982 to 1988 a ferruginous hawk mitigation study was conducted in the Kennedy Wash area of the Uintah Basin (Stalmaster 1985, 1988). During this research project, white-tailed prairie dog densities were determined by counting white-tailed prairie dogs seen along established transects in April and June. Numbers of white-tailed prairie dogs observed varied from a high of 242 white-tailed prairie dogs per km^2 (629 per mi^2) in 1983 to a low in 1987 of 13 white-tailed prairie dogs per km^2 (33.8 per mi^2). In 1988, the white-tailed prairie dog population increased and was estimated at 65 white-tailed prairie dogs per km^2 (169 per mi^2).

Black-footed ferret habitat surveys were conducted in the Kennedy Wash sub-complex from 1998 to 2003 (Table 11; Figure 7). The Kennedy Wash sub-complex showed a pattern of trend similar to that documented in Coyote Basin; the population declined slightly from 1998 to 2001, increased sharply in 2002 and declined significantly in 2003. The coefficient of variation for Kennedy Wash was 48% (Table 12).

Snake John-- Black-footed ferret habitat surveys were completed in the Snake John sub-complex from 2001 to 2003 (Table 11; Figure 7). White-tailed prairie dog population estimates were similar in 2001 and 2002, but like Kennedy Wash and Coyote Basin, populations declined significantly in 2003. The coefficient of variation for Snake John was 25% (Table 12).

Shiner Basin-- Shiner Basin was surveyed from 1997 to 2000 (Table 11; Figure 7). White-tailed prairie dog populations declined from a high of 47,551 in 1998 to an estimated low of 5,383 in 1999. Due to this significant decline, Shiner Basin was removed from consideration as a black-footed ferret release site even though transecting in 2000 documented an increase in the white-tailed prairie dog population estimate. For the 4 years of surveys, Shiner Basin had a coefficient of variation of 91% (Table 12).

In 2002 and 2003, a low intensity survey effort (~ 60% of area sampled) was conducted within the Shiner Basin Management Area in order to evaluate white-tailed prairie dog population recovery (B. Zwetzig, BLM, pers. comm.). Survey results showed presence of white-tailed prairie dogs but at extremely low densities.

Averaging white-tailed prairie dog population estimates for all four Black-footed Ferret Management Areas surveyed in Utah from 1997-2003 showed a pattern of populations reaching high densities with subsequent declines in both 1999 and in 2003 (Figure 7). White-tailed prairie dog populations at all 4 Black-footed Ferret Management Areas within the Uintah Basin fluctuated despite the short term duration in monitoring (3-7 years/site) with coefficients of variations ranging from 25% to 91% (Table 12; Figure 7). Population estimates demonstrated dramatic increases and decreases in numbers of white-tailed prairie dogs within a one-year period (e.g., Kennedy Wash increased from an estimated 3,670 prairie dogs [3/ha] in 2001 to 10,282 prairie dogs [8.6/ha] in 2002 and Shiner Basin saw a decline in white-tailed prairie dogs from 47,551 [10.99/ha] in 1998 to 5,383 in 1999 [1.76/ha]) (Table11). Because white-tailed prairie reproduce only one time per year and produce an average of 5.64 ± 0.74 embryos per litter on the basis of uterine swellings (Bakko and Brown 1967), these oscillations in population estimates are biologically significant. Whether these fluctuations are normal is unknown and can not be determined with the short-term duration in sampling. Additional long-term data is needed to evaluate trends.

Changes in Occupied Habitat

Mapping of occupied habitat in Utah has been undertaken by a number of governmental agencies and consulting firms. Methods used and location of areas selected to compare changes in the amount of occupied habitat between surveys are described below.

Cedar Creek Associates (1986)-- Colonies were located with aerial surveys. Aerial surveys were flown along parallel transects spaced approximately 1 km apart. All colonies located during aerial surveys were visited on the ground to map colony boundaries based on distribution of both active and inactive burrows. Occupied habitat was calculated by placing a calibrated grid over each mapped colony and counting the number of grid and partial grid squares contained within the colony boundary. The total number of grid squares was then multiplied by the known hectare of one grid square.

Boschen (1986)-- Colony boundaries were determined by driving an ATV around the perimeter of burrows and hand drawing boundaries onto a topographic map. Colonies were defined as "areas with 10+ burrow openings per/ha". Burrow activity was not assessed during surveys.

Intermountain Ecosystems (1994)-- White-tailed prairie dog colonies were first identified with helicopter surveys and then on-the-ground inventories were conducted to map extent of colonies, document other colonies not recorded during aerial surveys and estimate white-tailed prairie dog densities using belt transects. Percent activity was estimated by recording active versus non-active burrows found along transects. Both active and inactive burrows were included in estimate of occupied habitat.

Seglund (2002)-- White-tailed prairie dog colonies were located from existing roads. Once a colony was located, an observer drove the perimeter of the colony on an ATV delineating the boundary with an on-board Trimble GPS unit. To classify white-tailed prairie dog activity level, observers randomly walked throughout each colony counting the number of active and inactive burrows based on the presence of fresh white-tailed prairie dog fecal material. A colony was considered active if the number of active burrows was greater then 25% of the total counted. Both inactive and active areas were mapped and included in estimate of occupied habitat.

Maxfield (2002)-- Colonies were located from existing roads. Colony boundaries were mapped by a stationary observer located at an elevated point within or near a colony that visually estimated colony boundaries. Boundaries were hand-marked onto topographic maps and digitized into GIS. Colony activity was not evaluated during this process.

All other mapping completed for comparisons was done following Biggins et al. (1989, 1993).

The occupied habitat analysis measured changes over intervals from 8 to 17 years. Annual percent change in occupied habitat at all sites varied from -10.8% to 30.6% (Table 13, Figure 8). For sites monitored for 17 years the average annual percent change in occupied habitat was 1.74% (n = 6, range = -4.9% to 8.7%); for sites measured for 8 years average annual percent change in occupied habitat was 19.8% (n = 2, range = -10.8% to 30.6%); and for the single site sampled at a 12 year interval annual percent change was 17.8%. Site locations and changes in occupied habitat are described below.

Huntington-- In 1994 within a project area of 250 km^2 (97 mi^2), an Environmental Assessment was completed on a proposed coalbed methane project near Price (Intermountain Ecosystems 1994). The project area extended south of Helper to Huntington, west to Hiawatha and east to Elmo and Wellington (Figure 9). In 1994, 2,352 ha (5,813 ac) were located and mapped. In 2002, the area was resurveyed resulting in 795 ha (1,964 ac) of occupied habitat (Seglund 2002).

Buckhorn and Woodside-- Mapped habitat within these two areas extended south of Huntington to Interstate 70 along US State Highway 10, east to US State Highway 6 (Figure 9). Cedar Creek Associates (1986) located and mapped 3,555 ha (8,784 ac) within these two areas. In 2002, the areas was resurveyed resulting in 3,908 ha (9,656 ac) of occupied habitat (Seglund 2002).

Crescent Junction-- Mapped habitat within this area extended along Interstate 70 just east of Thompson Springs and west of Green River in Emery and Grand counties (Figure 10). Cedar Creek Associates (1986) located and mapped 4,089 ha (10,103 ac) within this area. In 2002, the area was resurveyed resulting in 3,973 ha (9,817 ac) of occupied habitat (Seglund 2002).

Cisco Desert-- Between July 1985 and February 1986, mapping and estimation of burrow densities for white-tailed prairie dogs was undertaken by UDWR (Boschen 1986) in an area encompassed by the Book Cliffs, Arches National Park and the Colorado River (Figure 10). Surveys resulted in 16,729 ha (41,336 ac) being located and mapped. A majority of the colonies contained an average of 2 to 10 active burrows per ha (4.94 -9.88 per ac). Only 499 ha (1,233 ac) had greater than 20 active burrows per ha (49.4 per ac).

In August of 1991 and 1992, the Cisco Desert complex was revisited to estimate white-tailed prairie dog density (Boschen 1991, 1992). This area was reevaluated because white-tailed prairie dogs appeared to have declined after the mapping in 1985/86. Random line transects were placed within portions of the 1985/86 mapped colonies and the number of white-tailed prairie dogs observed while driving transects was recorded. From 1991 to 1992 there was a marked increase (360%) in the number of white-tailed prairie dogs detected along transects. In the 1991 surveys, a mean of 67 white-tailed prairie dogs was recorded per colony (12 colonies transected) with densities along transects ranging from 0 to 278 white-tailed prairie dogs. In 1992, a mean of 452 white-tailed prairie dogs was counted per colony (8 colonies transected) with a range of 14 to 1,297 animals recorded.

In 1997 and 2001, black-footed ferret habitat surveys (Biggins et al. 1989, 1993) were completed in the 1985/86 mapped areas of the Cisco Desert. In 1997, 11,182 ha (27,630 ac) (67% of the complex) were sampled with 55.7% or 6,228 ha (15,389 ac) rated as good black-footed ferret habitat. A total of 2,322 active and 2,609 inactive burrows were counted along transects resulting in a white-tailed prairie dog population estimate for the entire complex of 50,089 (4.84 prairie dogs per ha [12 per ac]). In 2001, a total of 5,451 ha (13,469 ac) (33% of the complex) were evaluated. Only 17% of burrows were found to be active (208 active burrows/1,186 of total burrows detected) with 83% inactive (978 inactive/1,186 total burrows detected). Because of the low activity level recorded in 2001, remapping of the Cisco complex in 2002 was undertaken. This mapping effort resulted in 2,682 ha (6,627ac) of occupied habitat (Seglund 2002).

Eightmile Flat, Twelvemile, Sunshine Bench-- A Resource Management Plan identified sites within the Diamond Mountain Resource Area as potential black-footed ferret reintroduction sites (U.S. Department of the Interior 1993). The area is located west and north of the Green River in northeastern Utah. Two sites, Eightmile Flat and Twelvemile Flat, were first mapped in 1985 by Cedar Creek Associates (1986) (Figure 11). In 1985, Twelvemile Flat contained 363 ha (897 ac) and Eightmile Flat contained 2,673 ha (6,605 ac) of occupied habitat. In 1992 and 1993, Eightmile Flat and Twelvemile Flat were reevaluated as to their suitability as black-footed ferret reintroduction sites and a third site, Sunshine Bench, was also surveyed (Cranney and Day 1994) (Figure 11). Mapping on Sunshine Bench yielded a total of 2,085 ha (5,151 ac) of occupied habitat. Twelvemile Flat was remapped during the 1992/93 surveys showing an increase in size from 363 ha (897 ac) in 1985 to 771 ha (1,905 ac) in 1993 (Cranney and Day 1994). Remapping of Eightmile Flat was not completed in the 1992/93 surveys. Within the 3 areas, a total of 548 burrow density transects were sampled covering 164 ha (405 ac) (Biggins et al. 1989, 1993). Active burrow densities ranged from 0 to 10.37 per ha (0 - 25.62 ac) and the white-tailed prairie dog densities from 0 to 1.53 per ha (0 -3.78 per ac). None of the transects sampled met the minimum criteria for classification of good black-footed ferret habitat (Cranney and Day 1994).

In 1999, Eightmile Flat was remapped by the BLM resulting in a 9% increase in occupied habitat from 1985 (B. Zwetzig, BLM, pers. comm.). In 2002, Sunshine Bench and Twelvemile Flat were remapped by UDWR showing an increase in occupied habitat of 73% and 60%, respectively (Maxfield 2002).

Coyote Basin-- This area was first mapped in 1985 by Cedar Creek Associates (1986) (Figure 11). During this mapping effort 2,424 ha (5,990 ac) of occupied habitat was delineated. Remapping of this area in 1997 following Biggins et al. (1989, 1993) yielded an increase in occupied habitat to 7,604 ha (18,789 ac) (B. Zwetzig, BLM, pers. comm.).

<u>Current Occupancy</u>

UDWR began a Statewide mapping effort to quantify the current area occupied by white-tailed prairie dog colonies on public lands in 2002. Methods of data collection varied slightly among UDWR administrative regions, but all relied upon site visits to describe colony size and activity. The 2002 to 2003 surveys estimated that white-tailed prairie dog colonies occupied 57,463 ha (141,808 ac) in Utah. Colonies in Grand, Emery and Carbon Counties in south central Utah occupied 10,869 ha (26,856 ac) on public lands (Seglund 2002). Within the Uintah Basin of northeastern Utah, 46,521 ha (114,951 ac) of occupied habitat were recorded (Maxfield 2002). In northern Utah, five colonies consisting of 73 ha (180 ac) were mapped in 2003 (A. Kozlowski, UDWR, pers. comm.).

Predicted Range Model

Sixteen percent of the white-tailed prairie dog gross range and 13% of the predicted range occurs in Utah (Table 1, Figure 12). Three percent of the white-tailed prairie dog gross range in Utah is located on agricultural lands, while 0.2% of the predicted range is impacted by urban areas (Tables 6 and 7). Twenty percent of both gross range and predicted range is located on private land within the State (Table 14). Within Utah, 11,187 oil wells are currently located in the gross range and 8,835 oil wells are located in the predicted range.

Limiting Factors

Disease -- Sylvatic plague monitoring has been conducted by the USGS in Coyote Basin and Kennedy Wash since 2000 (Biggins 2003a). Blood samples have been collected from white-tailed prairie dogs, *Peromyscus maniculatus* and *P. truei*. This monitoring is in response to the use of Deltamethrin as a tool to study the ecology of plague as well as examine its effectiveness at controlling flea populations. Plague was detected in Kennedy Wash in 2001 and 2002 and in Coyote Basin in 2002 (Biggins 2001, 2003a). Serological test results in 2002 found 2 sero-positive white-tailed prairie dogs in Coyote Basin (109 sampled) and one in Kennedy Wash (45 sampled) (Biggins 2003a). Plague was not detected at either site in 2003 (D. Biggins, USGS, pers. comm.). Though low levels of plague have been detected in Coyote Basin and Kennedy Wash, surveys do not suggest an epizootic level of the disease.

Changing plant communities and drought -- Within much of the white-tailed prairie dog habitat in Utah, cheatgrass establishment over native perennial grasses and forbs has been extensive (Boschen 1986, B. Maxfield, UDWR, pers. comm.). Cheatgrass competes for moisture with other more desirable species due to its winter and early spring growth (Whitson et al. 2000). After cheatgrass reaches maturity in early summer, it provides little nutrition and moisture either above or below ground for herbivores (Stubbendieck et al. 1997). This may hinder the ability of white-tailed prairie dogs to build sufficient fat reserves, resulting in decreased overwinter survival, subsequent reduced reproductive rates and increased rates of parasitism. Utah prairie dog colony extinction rates have been found to increase as the number of native, locally occurring plant species declined (Ritchie 1999).

Ongoing drought conditions in Utah over the past 5 years may have negatively impacted white-tailed prairie dog populations. In the past few years, white-tailed prairie dogs have been observed foraging on plant species during the early summer months that they usually do not use until early to late fall (B. Zwetzig, BLM, pers. comm.). These species include Gardner's saltbush and cactus. They have also been seen foraging throughout the summer months on ants. The changes in observed foraging activities may indicate that preferred species are not available for consumption and that they are instead relying on alternative sources for nutritional needs. In addition, white-tailed prairie dogs have been observed emerging throughout the winter months possibly indicating inadequate body condition to maintain hibernation (P. Schnurr, CDOW; B. Zwetzig, BLM, pers. comm.). During the hibernation phase, mass losses of 26-30% have been recorded for yearling white-tailed prairie dogs (Cooke 1993). Thus an inability of white-tailed prairie dogs to build sufficient mass to compensate for overwinter losses is detrimental to survival and subsequent reproduction. Rayor (1985) found that Gunnison's prairie dogs on lower quality habitats had lower overwinter survival than those occupying habitats with high quality vegetation.

Human Disturbance -- Human disturbances on white-tailed prairie dog habitats in Utah are limited mainly to shooting, oil and gas development and agriculture. Shooting closures during the breeding season (1 April-15 June) were implemented in 2003 on all public lands. Previous to this closure, only Coyote Basin and Kennedy Wash were protected from shooting by having a year-round closure since 1999. The UDWR does not maintain harvest data on the number of recreational shooters or the number of white-tailed prairie dogs taken from areas, making it impossible to evaluate the impact of this disturbance. However, there does not appear to be a difference in population trends between the two areas closed to shooting in 1999 versus those left open. Continued research is needed to accurately determine the effects of this activity on the long-term viability of this species.

Oil and gas development within white-tailed prairie dog habitat has accelerated within the past few years. Utah ranked 14th in the United States in crude oil production and 12th in natural gas (marketed) production (including Federal Offshore areas) during 2002 (Utah Department of Natural Resources 2004). Most oil and gas activities occur in Uintah, Dueschne and Carbon counties (Utah Department of Natural Resources 2004) (Table 15). Oil and gas wells affect small areas averaging less than 0.8 ha (2 ac), but with the proposed 8.1 ha (20 ac) spacing of wells in Utah, this accelerated development will result in large amounts of habitat lost due to road development and well pad construction. States have reclamation rules that require impacted lands to be restored to their original condition after a well is abandoned, however for the life of a well, habitat will remain fragmented and lost. Conversely, these disturbances can cause reductions in shrub cover providing additional habitats for white-tailed prairie dogs to colonize after a well is removed.

Agriculture conversion is also a threat to white-tailed prairie dogs in Utah. Much of this land conversion is occurring in the Uintah Basin and in Rich, Carbon and Emery counties. White-tailed prairie dogs in Carbon and Emery counties have seen declines in occupied habitat, while many sites in the Uintah Basin have increased in occupied habitat. Agriculture conversion can negatively impact white-tailed prairie dogs when associated with poisoning and shooting of animals on private lands. Possibly due to these disturbances, white-tailed prairie dogs become widely dispersed and isolated into colonies of less than a hectare to a few hectares in size. On the other hand, these hyper-productive lands can provide high quality nutrition leading to higher densities of animals and increased colonization.

Wyoming (authored by Martin Grenier and Bob Luce)

The last known free-ranging black-footed ferret population was discovered in 1981 at a white-tailed prairie dog complex in Park County near Meeteetse, Wyoming. This discovery initiated the development of the Strategic Plan for Management of the Black-footed Ferret in Wyoming (WGFD 1987). The completion of the document spurred prairie dog mapping efforts for both black and white-tailed prairie dogs in Wyoming. The WGFD, with the assistance of the University of Wyoming Cooperative Fish and Wildlife Unit (UW), mapped over 202,350 ha

(500,000 ac) of prairie dogs throughout the State between 1987 and 1990 (B. Oakleaf, WGFD, pers. comm.). Mapping conducted during this time was a culmination of many efforts (e.g., reintroduction site evaluation, follow-ups of reported black-footed ferret sightings, Section 7 Clearance Surveys on pipeline, powerline and other projects, etc). The results were compiled and townships were classified into two categories: 1) townships containing 405 ha – 810 ha (1,000-2,000 ac) of occupied prairie dog habitat; and 2) townships with over 810 ha (2,000 ac) of occupied habitat (Figure 13).

As part of this effort, the WGFD identified 18 complexes within the range of the white-tailed prairie dog (Table 16, Figure 2). A range-wide survey has not been conducted in Wyoming since 1990. Therefore there are no current State-wide data with which to compare 1987 - 1990 distribution and population with 2004 to document an occupied habitat or population trend for white-tailed prairie dogs in Wyoming. However, trend can be inferred from evaluation of quantitative data collected at several sites where data are available for both 1987 - 1990 and 2002 - 2004. The data presented below represent only a sample of the total occupied habitat, and a minimum estimate of both white-tailed prairie dog distribution and abundance.

Due to variation in sampling efforts attributed to the following: lack of resources and staff; weather; conflicts associated with other reintroduction program priorities; and inconsistencies in colonies surveyed between survey years, often due to lack of access to private land (P. Hnilicka, USFWS, pers. comm.); comparisons of occupied area, data evaluations and conclusions will be limited to areas that received consistent and similar sampling efforts between areas.

Monitoring Efforts

The Meeteetse and Shirley Basin/Medicine Bow (Shirley Basin) complexes were the only two complexes in Wyoming seriously considered for the release of black-footed ferrets. These two complexes have been subjected to intensive prairie dog mapping efforts over the last two decades. The remaining 16 complexes, with the exception of those addressed in this section of the Conservation Assessment, have not been remapped since 1990 (B. Oakleaf, WGFD, pers. comm.). Despite obvious similarities (e.g., intensive monitoring, presence of sylvatic plague, etc.) between Meeteetse and Shirley Basin, the two complexes actually differ dramatically in at least two ways, and these differences have likely accounted for the differences in the trend in occupied hectares at these two sites. First, the two complexes varied significantly in size, 4,865 ha (12,021 ac) in Meeteetse and 62,114 ha (153,483 ac) in Shirley Basin. Second, only the Meeteetse complex was surveyed in its entirety during multiple sample years (Biggins 2003b). From 1992 to 2001, transecting in Shirley Basin to evaluate black-footed ferret habitat potential focused only on portions of the Primary Management Zone 1 (PMZ1) rather than on the entire complex (Hnilicka and Luce 1993, Luce and Steiner 1994, Luce et al. 1997, Luce 1998, Luce 2000b, Van Fleet et al. 2001, Grenier et al. 2002) (Table 17).

Since the last known population of black-footed ferrets was discovered near Meeteetse, the area has been the focus of a great deal of research (Forrest et al. 1985, Clark 1986, Clark et al. 1986, Collins and Lichvar 1986, Forrest et al. 1988, Ubico et al. 1988, Clark 1989, Menkens and Anderson 1991). A standard mapping method was not used to map the Meeteetse complex in 1981 to 1984, but the complex was remapped in 1988 according to the Biggins et al. (1989, 1993) methodology (Black-footed Ferret Advisory Team 1990). The Biggins et al. (1989, 1993) methodology was subsequently adopted as a standardized survey method for evaluating black-footed ferret habitat potential, and all surveys completed after 1988 in Meeteetse utilized this methodology. The Center for Disease Control in Fort Collins confirmed plague in the Meeteetse complex in 1985 (Clark 1989).

Shirley Basin was subdivided into two sub-complexes in order to prioritize black-footed ferret reintroductions and facilitate monitoring on the mega-complex: 1) PMZ1 includes the northern portion of the complex and has a higher proportion of public lands; and 2) Primary Management Zone 2 (PMZ2) includes the southern portion of the complex and is primarily private lands (Figure 14). PMZ1 represents approximately 31% of the potential habitat that existed in Shirley Basin in 1991. Prior to 2001, when cursory surveys indicated that little habitat potential existed (e.g., colonies sizes were small, dispersed and appeared to be below the energetic threshold for ferrets) some colonies in PMZ1 were not remapped or surveyed. Unfortunately, the reported survey results for PMZ1 have become synonymous with trends (e.g., perceived declines) for the entire Shirley Basin complex between 1991 and 2001 (Biggins and Kosoy 2001), although only a fraction of the entire Shirley Basin complex was transected on an annual basis (Table 17).

Following the initial black-footed ferret releases in 1991, active sylvatic plague was documented in PMZ1 by collection of prairie dog carcasses found during mapping (Hnilicka and Luce 1993). Survey efforts in Shirley Basin between 1992 and 2001 were focused entirely in PMZ1, and due to the constraints previously discussed; the survey efforts in any given year represented only between 18% and 85% of the available habitat within PMZ1, making trend analysis problematic. Furthermore, annual survey efforts only represented between 6 and 26% of the entire Shirley Basin complex (Table 17).

In addition to the above-mentioned monitoring efforts at Meeteetse and Shirley Basin, some of the 16 additional WTPD complexes in Wyoming, including Kinney Rim, Sweetwater and several other smaller complexes, have been evaluated for black-footed ferret habitat potential on at least two separate occasions. Those were as follows--1) The Kinney Rim complex was sampled in 1989 (Conway 1989) and again in 1993 (Albee 1993); 2) Biggins (2003c) reevaluated 10 complexes in Wyoming between 1997 and 1998, complexes, which were originally surveyed in 1975 to 1981. However, because the Biggins (2003c) methodologies differed from the original survey efforts, results are not directly comparable but trend may be inferred; 3) in 2002 the WGFD conducted surveys at three historic complexes (e.g., Dad, Moxa, Sweetwater) in an effort to evaluate historic versus current occupied hectares. The Dad and Moxa complexes had very low white-tailed prairie dog densities and were therefore not surveyed further, while the Sweetwater complex received additional survey effort.

Population Analysis

Limited current data and lack of consistent past survey information for white-tailed prairie dog complexes in Wyoming makes long-term trend analysis biologically and statistically unsupportable for most individual complexes and at the Statewide level. However trends can be inferred from a few areas that have comparable survey efforts.

Declines in the white-tailed prairie dog estimate at the Meeteetse complex have been documented and reported by Biggins (2003b). Biggins (2003b) reported an estimated 25,494 white-tailed prairie dogs within the Meeteetse complex in 1988, but by 1989, the reported white-tailed prairie dog estimate decreased to 17,692, and then dropped to a low of 1,299 in 1993. These declines followed, and were probably the result of, the sylvatic plague epizootic of the mid-1980s. By 1997, the white-tailed prairie dog estimate for Meeteetse had increased to 7,095 (Table 18).

Sample transects in 10 of the 11 white-tailed prairie dog colonies (Colonies # 2-11) mapped by Luce in 2000 (Luce 2000a) did not reveal any transects with greater than 8 total burrows, therefore sampling using Biggins et al. (1989,1993) was not conducted. Small areas of high white-tailed prairie dog densities and/or large areas of low white-tailed prairie dog densities both tended to fall out of the Biggins et al. (1993) model. Colony #1, with a mapped area of 35 ha (87 ac), was transected, however, only three transects had greater than 8 total burrows, and no transect had greater than 25 active burrows. All data combined indicate very low densities, and the colonies surveyed in 2000 combined for only 14% (1,066) of the total white-tailed prairie dog estimate reported in 1997 by Biggins (2003b) for the same area. Data are not available to estimate population trends for the entire Meeteetse complex after 1997 however Biggins (2003b) suggests that white-tailed prairie dogs remained scattered throughout the larger area.

Sylvatic plague was first documented in Shirley Basin in 1987 (Orabona-Cerovski 1991) and impacted colonies to at least some extent through 1995. The WGFD conducted surveys of selected prairie dog colonies between 1992 and 2001 in Shirley Basin PMZ1. Results indicated that white-tailed prairie dog abundance appeared to have decreased, as a result of sylvatic plague and at least in one year, flooding. However, Grenier et al. (2003) indicated a different trend. White-tailed prairie dog abundance appeared to be increasing in PMZ1 and adjacent areas, in part due to increases in occupied hectares both in areas previously mapped, and in new areas. This trend is difficult to document from the transecting data (Luce 2000b, Grenier et al. 2003). Large annual fluctuations of white-tailed prairie dog estimates within colonies were reported in Shirley Basin (Luce 2000b). Consistent comparative data are available for four colonies (#165, #166, #167 and #168). These colonies were surveyed during each year from 1991 to 2000, including in 1994 when only 6% of PMZ1 was transected (Figure 15). For example, Colony #166 decreased from an estimated high of 7,321 prairie dogs in 1991 to low of 0 in 1995, then rebounded to 5,480 in 1996 and decreased again to 0 in 1999 and 2000. Colony #168 decreased from an estimated 4,066 prairie dogs in 1992 to 404 in 1995, then increased to 2,433 in 1997, dropped to 0 in 1999 and increased again to 638 in 2000 (Figure 15). Despite those fluctuations, the changes in distribution of white-tailed prairie dogs within the Shirley Basin complex, especially pioneering of new colonies, reported in Grenier et al. (2002), have increased the white-tailed prairie dog occupied area. Ocular estimates of white-tailed prairie dog populations within colonies mapped in 2004 indicate increased densities and abundance, although no quantified estimates of the population is available (Grenier et al. in press). Population trends for the entire Shirley Basin complex cannot necessarily be projected from the above-presented data, but the trend is inferred.

The Kinney Rim complex, when sampled in 1989, had a white-tailed prairie dog estimate of zero using Biggins et al. (1989, 1993) (Conway 1989). Conway reported that area was very spotty with low densities and suspected that sylvatic plague was impacting the complex. Four years later, the complex was re-sampled (Albee 1993) and only 10 of the original 38 colonies were transected. However, the 10 colonies had a white-tailed prairie dog estimate of 8,111, an increase from 1989 (Albee 1993). In 1997, WGFD re-sampled 6 colonies within the complex. The 6 transected colonies had a white-tailed prairie dog estimate of 2,822. No further attempts have been made to quantify trends at this complex.

Biggins (2003c) reported that 6 of the 10 (60%) complexes first mapped in 1975 to 1981, and reevaluated in 1997 and 1998 in Wyoming, had positive relative changes in total number of burrows, even though less area was surveyed in 1997 and 1998. These results indicate that the area occupied by white-tailed prairie dogs increased in density between sample years. Additionally, Biggins (2003c) stated that on a positive note, the detection of both declines and increases seems to suggest that white-tailed prairie dogs are not in imminent jeopardy, even if their ecological function has been impaired by the introduction of plague.

Changes in Occupied Habitat

Mapping efforts prior to 1989 did not follow Biggins et al. (1989, 1993), therefore it is impossible to project trends in populations of white-tailed prairie dogs between 1987 - 1990 versus 2002 within the majority of complexes, even though some complexes were resurveyed in 2002.

White-tailed prairie dog occupied habitat has been quantified in only a few complexes (Table 16). However, WGFD personnel have noted changes in occupied hectares resulting in both increases and decreases in occupied area since the mid-1990s in Carbon, Fremont, Park and Sweetwater counties. However, because these changes were not quantified, our analysis in this section will be limited to areas where the magnitude of change has been quantified with on-the-ground surveys.

Declines of white-tailed prairie dog hectares at the Meeteetse complex have been documented and reported by Biggins (2003b) and Luce (2000a). The Meeteetse complex was surveyed annually from 1988 to 1993, again in 1997 (Biggins 2003b) (Table 18) and the Pitchfork Ranch portion was resurveyed in 2000 at the request of the landowner. The 1988 data delineated 15 prairie dog colonies encompassing 4,860.5 ha (12,010 ac) (Biggins et al. 1989). Remapping in 1989 increased the number of reported towns to 16 and occupied hectares to 4,931.5 (12,186 ac) (2003b). By 1993, the occupied hectares had increased to 5,170 (12,775 ac). The same number of hectares was documented in 1997. Biggins (2003b) suggested that white-tailed prairie dogs remained scattered throughout the larger area. Small areas of high white-tailed prairie dog densities and/or large areas of low white-tailed prairie dog densities both tended to fall out of the Biggins et al. (1993) model. In 2000, Luce (2000a) surveyed the East Core, West Core, Pickett Creek and Rose Creek colonies on the Pitchfork Ranch portion of the Meeteetse Complex. Luce reported that only 57 ha (140.8 ac) remained where approximately 2,705.5 ha (6,689 ac) previously existed, a net decline of 2,648 ha (6,543 ac).

At Shirley Basin, Grenier et al. (2002) reported a net increase of occupied hectares within approximately 20% of the surface area of the complex between 1991 and 2001 (Figure 16). Although overall, the number of prairie dog colonies declined from 14 to 11 in 1991 and 2001, respectively, the associated occupied hectares increased during that same time from 4,894 ha (12,092 ha) to 5,814 ha (14,366 ac).

During the summer of 2004 the survey effort within the Shirley Basin/Medicine Bow Black-footed Ferret Management Area (Figure 17) was expanded. Approximately 72% of PMZ1, originally mapped in 1990, and 83% of the colonies mapped in 2001 were all remapped in 2004. Mapping was conducted by circumscribing the perimeter of the colonies on-foot using a GPS unit. Sixty colonies were located and mapped in 2004 totaling 15,059 ha (37,212 ac) (Grenier et al. in press). Results indicated that number of colonies have doubled from the 1990 estimate of 30. Occupied habitat in 2004 represents approximately a 50% increase from the 1990 estimate of 10,427 ha (25,768 ac).

Similarly, Grenier et al. (2003) reported a net increase in occupied hectares for the Sweetwater complex. The number of prairie colonies mapped increased from 40 in the 1980s to 45 in 2002. In addition, the 2002 survey results indicated that approximately twice as many hectares were mapped in 2002, 4,544 ha (11,228 ac), than were formerly mapped, 2,428 ha (6,000 ac) (Figure 18). Occupied hectares within the areas surveyed in the Shirley Basin and Sweetwater complexes have increased for a combined 3,036 ha (7,502 ac) through 2001 and 2002, respectively.

The Kinney Rim complex was first sampled by Conway (1989). Conway (1989) reported that the area was very spotty with low densities and irregular activity making mapping difficult. In addition, a significant number of hectares also existed in Colorado in the same complex, as defined by (Biggins et al. 1989, 1993). Conway (1989), having documented several dead prairie dogs during transecting, suspected that sylvatic plague was impacting the complex during the 1989 survey, although no attempts were made to confirm presence of plague. The occupied hectares reported in 1989 were 7,215 ha (17,828 ac) (Conway 1989). In 1993, the complex was again re-sampled as part of the larger Little Snake Black-footed Ferret Management Area. Albee (1993) sampled 10 of the original 38 towns mapped by Conway (1989) and reported an increase in occupied hectares in Wyoming, a total of 7,281 ha (17,991 ac). Albee (1993) credited this increase primarily to differences in delineating colony boundaries for at least one town on the Kinney Rim complex. Consequently, he questioned the mapping accuracy for the complex even in 1993 (Albee 1993).

Biggins' Prairie Dog Research Update #9 (2003c), reported on a research project designed to compare prairie dog densities in selected complexes surveyed in 1975-81, and again in 1998. Due to differences in mapping methodologies, both the authors and Biggins caution that the 1975 to 1981 density and occupied area data presented for the 10 complexes in

Wyoming (Biggins 2003c) cannot be compared directly to the more recent mapping efforts (1998) by Biggins. The comparison cannot be made due to use of different methods of defining colonies and complexes between the 1975 - 1981 and 1998 (D. Biggins, USGS, pers. comm.). It is however, important to note that overall, the net difference in occupied hectares among the 10 complexes was a potential decline of 1,593.6 ha (3,938 ac). Unfortunately it is unclear whether the changes in occupied hectares between sample years are in fact declines or simply an artificial result of differences in methodologies (D. Biggins, USGS, pers. comm.).

Although recent mapping efforts by the Kemmerer BLM Field Office are incomplete (J. Wright, BLM, pers. comm.) trend in occupied hectares can be compared for some colonies present during past mapping efforts, and new colonies present during 2003 mapping efforts. Historic records indicate that 14,312 ha (35,365 ac) may have been occupied within the area surveyed by BLM pre-1981. The 2003 surveys reveal that a minimum of 11,798 ha (29,153 ac) are still present in the Kemmerer BLM Field Office. If we limit our comparison to prairie dog occupied hectares known to present in both the pre-1981 and again in 2003, occupied hectares have increased from 8,229 ha (20,334 ac) to 11,798 (29,153 ac). This supports data previously presented for Shirley Basin and Sweetwater that show shifts in occupied area occurring on a landscape scale. However the actual trend for the entire area is unknown as mapping efforts are incomplete and therefore not directly comparable between years.

A potential black-footed ferret sighting was reported to the WGFD near the Saratoga complex in late July 2004. In order to investigate the report, on August 16, 2004 we conducted aerial surveys of the Saratoga complex, in order to evaluate prairie dog occupancy within the area. Aerial surveys were conducted from a low altitude fixed-wing aircraft with the observer having both the historic map of the complex and a BLM 1:100,000 map in hand. B. Oakleaf reported that the Saratoga complex and the Bolton Ranch complexes had grown dramatically from the previous estimate of 12,194 ha (30,132 ac) and 2,718 ha (6,717 ac) respectively. The two complexes occupied only a few selected townships previously (Grenier 2005). The exact increase in occupied hectares is unknown, however, B. Oakleaf, reported that white-tailed prairie dogs now occupied habitat south to Encampment, west to the Sierra Madre, east to the Elk Mountain and north to I-80. The two complexes appeared to now be one large complex, and the new complex is suspected to be connected to the Shirley Basin complex. B. Oakleaf also reported that the occupied habitat was very dense and that black-footed ferret surveys were warranted.

<u>Current Occupancy</u>

There have been no efforts since 1995 to determine current Statewide occupancy for the white-tailed prairie dog in Wyoming. Several incomplete estimates between 1987 and 1995 indicated that Wyoming probably had a minimum of 185,988 ha (459,576 ac) of white-tailed prairie dog colonies (Figure 19), although no effort was made to quantify active versus not active hectares during the surveys. Analysis indicates that greater than 61% (114,160 ha) of the white-tailed prairie dog colonies in Wyoming occur on public lands.

Predicted Range Model

Wyoming represents 62% of the gross range and 75% of the predicted range of the white-tailed prairie dog (Table 1). Thirty-five percent of the gross range and 33% of the predicted range of the white-tailed prairie dog in Wyoming is on private land (Table 19). From these data it appears that current occupancy on public versus private land is comparable to available habitat (65% of the gross range is public land and >61% of WTPD occupied habitat is on public land). Three percent of the predicted range is agricultural land and <1% is urban (Tables 6 and 7). Oil and gas development has the potential to affect 9,791,694 ha (24,194,944 ac) or 77% of the gross range in the State.

CURRENT MANAGEMENT STATUS BY STATE

Colorado

The white-tailed prairie dog is classified as a small game species under the Colorado Wildlife Commission Regulation #300 A.2. Regulation #302.B sets method of take which includes rifles, handguns, shotguns, handheld bows, crossbows, pellet guns and slingshots, hawking and toxicants. A small game license is required to take white-tailed prairie dogs, with the exception of private landowners, their immediate family members and designees who may take white-tailed prairie dogs causing damage on their lands. The season Statewide is year-round with no bag or possession limits (#308). However, participants in shooting contests can take no more than five white-tailed prairie dogs during an event (Regulation #302-1.a.1). No take is permitted on National Wildlife Refuges.

Colorado collects harvest information on small game, including prairie dogs. This information can be obtained on line at the following web site: http://wildlife.state.co.us/hunt/Small_Game/harvest_statistics/02-03/small_game_harvest.pdf

All sportsmen who hunt small game in Colorado are required to sign up for the Harvest Information Program (HIP). HIP or MBHIP (Migratory Bird Harvest Information Program) is a national program originally designed to provide the USFWS with a means of improving nationwide harvest estimates of migratory birds. Sportsmen are required to sign up annually and to provide a current address (and in Colorado a phone number). This enables the resource agency to contact hunters more effectively for post-season harvest surveys.

In Colorado, the decision was made to piggyback onto the national program and to include all small game hunters in the hopes of improving harvest estimates of resident small game species. A number of small game-related harvest surveys are conducted by phone. Surveys are conducted each spring, following completion of the majority of small game seasons. Prairie dogs (black-tailed, white-tailed and Gunnison's combined) are 1 of 23 species included in Colorado's General Small Game Survey. Each year, a random sample of 10% to 15% is drawn for the general small game survey from among the hunters signed up for HIP for the current "season". In 2002/03, there were 70,159 hunters signed up for HIP. A sample of 8,289 hunters (12%) was drawn. The survey contractor attempts to reach each individual a maximum of three times before moving on to the next name. After a reasonable amount of time, the survey is terminated.   In general, results from the small game survey provide a reasonably precise estimate of harvest for resident small game species. Unfortunately, this is not the case for prairie dogs.

There are several reasons for our inability to provide good harvest estimates for prairie dogs. First, Colorado regulations do not specify a bag limit for prairie dogs as is found with the majority of small game species. Secondly, because prairie dogs are not “hunted” in the traditional manner, there are relatively few hunters. Low hunter numbers make it difficult to sample (randomly) enough hunters to provide the basis for a reasonable estimate of harvest. This is difficult enough at a Statewide level and becomes very problematic at the county level where one or two hunters may form the basis for the estimate.

Colorado has no bag limit for prairie dogs; hence the number reported harvested varies greatly. For the 2002/03 survey, hunters reported harvesting from 0 to 2000 prairie dogs. The large variation in prairie dogs harvested greatly increases the variance around the harvest estimate. In comparison, pheasant hunters (a bag limit of 3 and 9 in possession) reported harvesting between 0 to 90 birds and of those hunters 94% had harvested between 1 and 10 birds. The variance around this harvest estimate is much smaller and allows for a much greater level of precision.

Coupling the variance in numbers harvested with the relatively small number of hunters contacted through the survey (especially at the county level) makes the situation even worse. In 2002/03, the survey began with a sample of 8,289 hunters. A total of 3,562 hunters were contacted. Of these, 212 reported hunting prairie dogs and 189 reported harvesting prairie dogs. In comparison, the number of pheasant hunters contacted was 843.

The limitations of the survey for prairie dogs are further illustrated by noting the number of hunters contacted for individual counties. Hunters reported hunting prairie dogs in 43 counties. The number of hunters contacted for a given county ranged from 1 (8 counties) to 23 (1 county). The number of counties with 10 or fewer hunters contacted was 37.

Because of the wide variation in numbers harvested as well as the need to estimate harvest based on the response of a small number of individuals, Colorado’s prairie dog estimates should always be accompanied with the standard errors and ranges around the estimates that are provided on the CDOW home page. This information makes it clear that the estimates are not nearly as precise as others generated via the General Small Game Survey.

The CDOW recognizes the limitation of current surveys for accurately estimating prairie dog harvest. Steps are underway to revise the hunting survey to improve the prairie dog harvest estimates. These improvements will be in place for the next survey period; spring, 2005.

Some toxicants may be used by licensed applicators to control white-tailed prairie and are regulated by the Colorado Department of Agriculture or the EPA. Gas cartridges can be used without a license. Relocation of prairie dogs requires a permit and the permit must include a management plan specifically addressing the applicant’s long-term plans for maintenance or control of relocated white-tailed prairie dog populations (Regulation #302A.3). Colorado currently has no management or conservation plan for white-tailed prairie dogs and they are not included on the State Species of Concern or State threatened and endangered list.

Montana

In January 2002, the Montana Prairie Dog Working Group released the "Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana". This plan was approved by Montana Fish Wildlife and Parks, the Montana Department of Agriculture and the Montana Department of Natural Resources and Conservation, and cooperation was pledged by the BLM, U.S. Forest (USFS), the Bureau of Indian Affairs (BIA), Natural Resources Conservation Service (NRCS) and the USDA/Animal and Plant Health Inspection (APHIS). The plan can be accessed online at www.fwp.state.mt.us/publicnotices and following the links through 'management plans' to the prairie dog plan. The stated goal of the plan is to "*provide for management of prairie dog populations and habitats to ensure the long-term viability of prairie dogs and associated species.*" The five objectives deemed necessary to achieve this goal are as follows-- 1) Confer legal status that is consistent with policy provisions of Sections 87-5 102 and 103, MCA (completed, see designation below), 2) Develop Statewide and regional prairie dog distribution and abundance standards (underway), 3) Develop a management protocol for prairie dog conservation on Federal, State, and private lands, 4) Develop and implement a prairie ecosystem education program and 5) Identify and support or conduct research designed to form solutions to short-term and long-term biological and social problems related to prairie dogs. The proposed translocation of white-tailed prairie dogs to augment Montana colonies is described in the Conservation Plan.

White-tailed prairie dogs are listed on the Species of Concern List compiled by the Montana Natural Heritage Program and Montana Fish Wildlife and Parks. Status is defined as critically imperiled because of rarity or because some factor(s) of its biology make it extremely vulnerable to extinction. The informal designation of Species of Concern does not change the legal status of a species and is used by Montana Fish Wildlife and Parks to prioritize research and management needs among nongame wildlife species.

White-tailed prairie dogs are designated "Nongame wildlife in need of management" in the Nongame and Endangered Species Conservation Act of Montana (87-5-101, MCA et seq.). An annual rule regulating prairie dog recreational shooting jointly adopted by the Montana Fish Wildlife and Parks Commission under the authority of 87-5-105, MCA in 2002 and 2003 applies to public lands only (not including State school trust lands). This rule was adopted again in 2004. The regulations will be in effect until 28 February 2006. The department and the Montana Fish Wildlife and Parks Commission will determine management regulations for prairie dogs annually.

> By order of Montana Fish Wildlife and Parks and the Montana Fish Wildlife and Parks Commission, the recreational shooting of white-tailed prairie dogs occupying public lands other than State school trust lands within the following described portion of Carbon County will be closed year-round, beginning March 1, 2003. The portion of Carbon County within the following described boundary: where the Beartooth highway

(Highway 212) crosses the Wyoming State line, then north along highway 212 to its junction with Highway 72 at Rockvale, then south along Highway 72 to Edgar, then east along the Edgar to Pryor Road to the Crow Reservation boundary, then south and east along the Crow Reservation boundary to Bighorn Lake, then south along the west shore of Bighorn Lake to the Wyoming State line, then west along the Wyoming State line to its junction with the Beartooth Highway (Highway 212), the point of beginning. Within this area, white-tailed prairie dogs occupy approximately 48.5 ha (120 ac).

It should be noted that the area described above includes the entire known range of white-tailed prairie dogs in Montana. Additionally, the Department of Natural Resources and Conservation has closed prairie dog shooting on the Warren colony, which occurs on school State trust land.

Montana Department of Agriculture continues to provide technical assistance to private landowners with regard to prairie dog control. In Montana, poisoning of prairie dogs is conducted primarily by private individuals and is geared toward containment rather than landscape-scale eradication (Montana Prairie Dog Working Group 2002). Any use of toxicants for control must follow Environmental Protection Agency label directions. No take is permitted on National Wildlife Refuges.

The 2002 Montana Prairie Dog Conservation Plan addressed both white-tailed and black-tailed prairie dogs. Accomplishments to date that have benefited white-tailed prairie dogs include the reclassification of white-tailed prairie dogs as ‘non-game wildlife species in need of management’, the application of a year-round shooting closure on white-tailed prairie dogs occupying Federal lands, and a draft Environmental Assessment anticipating translocation of prairie dogs from Montana and Wyoming sites to formerly occupied colonies.

Utah

The white-tailed prairie dog is designated as a “nongame” mammal in Utah under Rule R657-19-2, Taking Nongame Mammals. R657-19 provides the standards and requirements for taking and possessing nongame mammals under authority of State Statute (23-13-3, 23-4-18, 23-14-19). The live capture of white-tailed prairie dogs and other nongame mammals is governed by Rule R657-3; Collection, Importation, Transportation and Subsequent Possession of Zoological Animals.

No license is required to take white-tailed prairie dogs (R657-19-10). White-tailed prairie dogs may be taken 24-hours-a-day, without bag or possession limits (R657-19-5). Take of white-tailed prairie dogs is prohibited on public lands from 1 April through 15 June, but they may be taken on private lands year-round. White-tailed prairie dogs may be taken in the following counties, which describe the limits of their gross range in Utah: Carbon, Daggett, Duchesne, Emery, Morgan, Rich, Summit, Uintah and all areas west and north of the Colorado River in Grand County. No take of white-tailed prairie dogs is permitted within the Primary Management Zone for black-footed ferret recovery bordering Colorado in eastern Uintah County (R657-19-2(b)). This year-round shooting closure was imposed in 1999 [Subsection (2)(b)(i)]. The closed area boundary begins at the Utah-Colorado State line and Uintah County Road 403, also known as Stanton Road, northeast of Bonanza, southwest along this road to SR 45 at Bonanza, north along this highway to Uintah County Road 328, also known as Old Bonanza Highway, north along this road to Raven Ridge, just south of US 40, southeast along Raven Ridge to the Utah-Colorado State line, south along this State line to point of beginning.

In 2003, UDWR added the white-tailed prairie dog to the agency's Sensitive Species List. The State Sensitive Species list was prepared pursuant to The State of Utah, Division of Wildlife Resources Administrative Rule R657-48. By rule, wildlife species that are federally listed, candidate for Federal listing or for which a conservation agreement is in place are automatically placed on the list. Additional species on the Utah list are those "wildlife species of concern" for which there is credible scientific evidence to substantiate a threat to continued population viability. The list is intended to stimulate development and implementation of management actions to precluded Federal listing of these species under the ESA. However at this time, Utah does not have a management or conservation plan for the white-tailed prairie dog.

Wyoming

Under the Wyoming Game and Fish Commission Regulations, the white-tailed prairie dog is classified as a nongame wildlife species (Chapter 52 [Nongame Wildlife], Section 6) and is classified as a Species of Special Concern with Native Species Status of 4 (NSS4) by the WGFD. Currently, Wyoming does not have a management or conservation plan for the white-tailed prairie dog. Within the State of Wyoming, white-tailed prairie dogs may be taken throughout the calendar year without a permit. The Wyoming Department of Agriculture classifies the white-tailed prairie dog as a pest under statute W.S. 11-5-101 through 11-5-119 (Weed and Pest Control Act of 1973) and unregulated take is allowed.

RISK ASSESSMENT

The July 11, 2002 petition to list the white-tailed prairie dog as threatened under the ESA asserted that all 5 USFWS ESA listing criteria apply to the white-tailed prairie dog (Center for Native Ecosystems et al. 2002). In this Risk Assessment, current information regarding threats is summarized, followed by an evaluation based on our current understanding of each identified threat. From this evaluation, options to be considered in a conservation strategy, and research needs required to adequately understand their impacts, were presented.

The threats to the white-tailed prairie dog that will be evaluated in the USFWS's 90-day and 12-month findings are:

1) The present or threatened destruction, modification or curtailment of its habitat or range

2) Over-utilization for commercial, recreational, scientific or educational purposes

3) Disease or predation

4) Inadequacy of existing regulatory mechanisms

5) Other natural or man-made factors affecting its continued existence

1) PRESENT OR THREATENED DESTRUCTION, MODIFICATION OR CURTAILMENT OF HABITAT OR RANGE

CURRENT INFORMATION

Throughout the 19th and 20th century, lasting changes in white-tailed prairie dog habitat have occurred. These changes resulted from conversion of rangelands to seeded pastures and croplands, urbanization, oil/gas exploration and extraction, intensive livestock grazing, alteration in fire regimes and proliferation of non-native plant species. How these changes have affected white-tailed prairie dog populations is difficult to determine since information is not available regarding white-tailed prairie dog populations prior to human induced alterations across the western landscape. Possible consequences (positive and negative) of these impacts are presented below.

<u>Agricultural Land Conversion</u>

Agricultural land conversions in conjunction with historic eradication efforts caused significant declines for all prairie dog species (Knowles 2002). This is because prairie dogs were not tolerated on agricultural croplands and disturbance by them on cultivated lands brought about control or eradication of local populations. Agriculture currently affects 6% of the gross range in Colorado, 7% in Montana and 3% in both Utah and Wyoming (Table 6).

Agricultural lands can be beneficial to white-tailed prairie dogs by providing highly-productive foraging habitat in place of their native arid landscape. In many areas, white-tailed prairie dog burrows can be found located adjacent to productive agricultural fields that provide white-tailed prairie dogs with highly nutritious forage. Due to this new abundant resource, white-tailed prairie dog populations may inhabit previously unsuitable areas and experience higher densities. This has been demonstrated for the Utah prairie dog where densities were found to be lower at sites not associated with agriculture (16 prairie dogs per ha [6.5 per ac]) and higher (36 prairie dogs per ha [14.6 per ac]) at sites associated with alfalfa fields (Crocker-Bedford 1976). The differences in densities were attributed to differing nutritional planes based upon quantity and quality of available forage.

<u>Urbanization</u>

In urban areas not only outright eradication of prairie dogs occurs, but habitat fragmentation and colony isolation are common. The impact of urbanization on white-tailed prairie dog habitat has not been studied. However, Collinge (2003) found that burrow and prairie dog densities were higher in black-tailed prairie dog colonies that were surrounded by urbanization and roads. These higher densities of prairie dogs created greater competition for resources and reduced habitat quality, leading to eventual population declines. Furthermore, dispersal was reduced or eliminated in urbanized landscapes making re-colonization after a plague epizootic or other population decline improbable. Irrigation of lawns and pastures, which accompanies urbanization, may somewhat offset the negative impact of urbanization by providing succulent forage. However this is a localized situation, and is not significant on a range-wide basis.

Oil/Gas Exploration and Extraction

A large portion of the white-tailed prairie dog range is classified as valuable for oil and gas development (Center for Native Ecosystems et al. 2002). Individual oil and gas wells affect an area averaging less than 0.8 ha (2 ac), but with close spacing of wells and significantly more wells proposed in the white-tailed prairie dog's range, this development has the potential to significantly decrease the amount of available white-tailed prairie dog habitat. States have reclamation rules that require impacted lands to be restored to their original condition after a well is abandoned however, for the life of a well, habitats will remain lost.

Possible direct negative impacts associated with oil and gas development include clearing and crushing of vegetation, reduction in available habitat due to pad construction, road development and well operation, displacement and killing of animals, alteration of surface water drainage and increased compaction of soils (USFWS 1990). Vibroseis (seismic exploration) may also affect prairie dogs by collapsing tunnel systems, causing auditory impairment and disrupting social systems (Clark 1986). Indirect effects include increased access into remote areas by shooters and OHV users. Gordon et al. (2003) found that shooting pressure was greatest at colonies with easy road access as compared to more remote colonies.

Many initial surveys of white-tailed prairie dog colonies were conducted in response to oil and gas companies evaluating potential black-footed ferret habitat within project areas as required by the USFWS (USFWS 1989). In Wyoming, each field office has had numerous "small scale" inventories of prairie dog colonies that were conducted as part of activity clearances, including clearances for oil and gas applications for permit to drill and associated road, pipeline, and powerline rights-of-way. While these clearances were conducted using the 1989 USFWS procedures for black-footed ferret clearances, they yielded temporal data on the geographic extent and activity of prairie dog colonies. In some instances, intensive prairie dog colony mapping efforts were the direct result of terms and conditions and conservation measures, required by ESA Section 7 consultations with the USFWS (e.g., Continental Divide / Wamsutter II O&G EIS, etc.) for other species, usually the black-footed ferret. In other cases, the BLM Field Office funded, or cost shared on the funding of up-dated, baseline prairie dog inventories (e.g., Pinedale and Kemmerer PDT inventories). Many of these surveys will not take place under the new black-footed ferret block clearance policy.

Though inventories have been required prior to development activities, post-development monitoring of white-tailed prairie dogs and their habitats has not been required. Only one study has attempted to demonstrate the effects of oil and gas disturbances on white-tailed prairie dogs and information from this study is preliminary (Baroch et al. 2004). The objective of this study is to assess the current status of colonies in an area undergoing rapid resource development in western Wyoming at the Pinedale Anticline natural gas field. The 2003 survey data found no activity at 48% of colonies that were surveyed in 2001, and the area occupied by white-tailed prairie dogs had declined by 95%. Unfortunately the researchers did not monitor colonies for plague, so reasons for this decline are unknown. Rapid declines in white-tailed prairie dogs also occur in areas not being heavily impacted by oil and gas development (see State section of this document).

Coalbed methane wells are a relatively new technology that relies on the extraction of methane gas from coal 200 to 5,500 feet below the surface. The Rocky Mountain Region has extensive coal deposits with untapped resources of coalbed methane in the Greater Green River Basin of Wyoming, Atlantic Rim in Carbon County, Wyoming (M. Read, BLM, pers. comm.); and the Uintah-Piceance Basin of Colorado and Utah. Wells are currently being developed near Price, Utah where small colonies of white-tailed prairie dogs exist and in the Piceance Basin in Western Colorado where white-tailed prairie dogs occur (E. Hollowed, BLM, pers. comm.).

Potential problems associated with coalbed methane development are increased human disturbance and habitat losses or fragmentation due to well development, pipelines, roads, and compressor sites; increased potential for shooting due to additional road development, and direct project-induced mortality. In addition, water disposal from methane extraction activities may have negative impacts on sagebrush-steppe habitats due to the high alkalinity of the water released.

Natural gas development has the potential to impact large areas in the white-tailed prairie dog range. The Continental Divide/Wamsutter II Project in Sweetwater and Carbon Counties, and Desolation Flats Project, Pinedale Anticline, Seminoe, Pathfinder, and Myton Bench are examples where exploration is taking place.

BLM offices in the respective States within the range of the white-tailed prairie dog address management of the species in relation to oil and gas development in colonies and/or complexes using different approaches. The BLM in Wyoming has no consistent, Statewide policy for the management of white-tailed prairie dogs on Public Lands at this time (D. Roberts, BLM, personnel communication) (Appendix III). There are 8 resource areas in Wyoming within the range of the white-tailed prairie dog (Worland, Cody, Rawlins, Rock Springs, Lander, Casper, Kemmerer and Pinedale), and 6 (excluding Rawlins and Casper) of these resource areas are exclusively white-tailed prairie dogs. All of these resource areas are conducting some form of prairie dog management and the white-tailed prairie dog has been declared a BLM sensitive species in Wyoming.

BLM land use planning efforts (Resource Management Plan [RMP] revisions) are underway at this time in the white-tailed prairie dog range in Wyoming (Rawlins, Pinedale, Casper, Kemmerer and Lander). These RMP revisions are primarily driven by the recent emphasis on oil and gas development activity. Each of these land use planning efforts is currently, or will be, addressing white-tailed prairie dogs in the plan revisions. BLM has also had nominations submitted by several environmental groups for the designation of prairie dog "areas of critical environmental concern" (ACECs) in the land use plans for public lands within white-tailed prairie dog range. A BLM Statewide, programmatic, biological evaluation is being prepared for white-tailed prairie dogs, the results of which will be incorporated into RMPs. The State of Wyoming, through WGFD, recently completed a draft conservation plan for black-tailed prairie dogs in Wyoming. While this plan was never adopted by the Game and Fish Commission, it did contain a number of management recommendations and planned actions that could apply to white-tailed prairie dogs. The BLM has referred to the State conservation plan to help focus white-tailed prairie dog management efforts and budgeting requests.

In Colorado, the white-tailed prairie dog range occurs within the jurisdiction of six Field Offices, with four of these Field Offices having no stipulations for oil and gas development in white-tailed prairie dog habitat (R. Sell, BLM, pers. comm.) (Appendix IV). The Little Snake and White River Field Office include black-footed ferret reintroduction areas and have stipulations related to black-footed ferret habitat protection, but do not specifically address white-tailed prairie dog conservation. The white-tailed prairie dog is not on the Colorado BLM Sensitive Species List.

Little Snake Field Office, Colorado

- Black-footed Ferret Management Plan objective is to maintain at least 90% of the known or potential white-tailed prairie dog habitat mapped on BLM surface in 1989.

- BLM Lease Notice LS-13 has the following stipulation:

  "No surface disturbance activities will be allowed that may significantly alter the prairie dog complex making it unsuitable for reintroduction of the black-footed ferret" meaning that a lease could not be developed in a manner that would harm the integrity of a white-tailed prairie dog complex.

- Design and location of proposed development may be adjusted per standard lease rights to request delays of implementation up to 60 days and relocation of operations up to 200 meters to avoid or minimize direct impacts to active white-tailed prairie dog colonies.

White River Field Office

- Black-footed Ferret Management Plan objective is to maintain at least 90% of the occupied prairie dog acreage on BLM surface in the Wolf Creek and Coyote Basin black-footed Ferret Management Areas.

- Black-footed Ferret Plan states: "Whenever possible, mineral development and utility installation activities will be designed to avoid adverse influence on prairie dog habitat. In the event adverse impacts to prairie dog habitat are unavoidable, activities will be designed to influence the smallest area practicable and/or those areas with the lowest prairie dog densities and compensatory mitigation may be required."

- Design and location of proposed development may be adjusted per standard lease rights to request delays of implementation up to 60 days and relocation of operations up to 200 m.

In Utah, the white-tailed prairie dog range occurs within the jurisdiction of the Vernal Field Office which includes Coyote Basin Black-footed Ferret Reintroduction Area and has stipulations related to black-footed ferret habitat protection but does not specifically address white-tailed prairie dog conservation (B. Zwetzig, BLM, pers. comm.). The white-tailed prairie dog range also occurs within the jurisdiction of the Price and Moab Field Offices which do not have directives with regard to white-tailed prairie dog management. However, both of these field offices are currently revising their Land Use Plans and in the new plans they will consider the white-tailed prairie dog in special status species alternatives (S. Madsen, P. Riddle, BLM, pers. comm.).

Vernal Field Office

Diamond Mountain RMP

- White-tailed prairie dog is on the list of Species Status Species
- White-tailed prairie dog occupied habitat is recognized only as potential black-footed ferret habitat
- Only active white-tailed prairie dog colonies are considered
- Coyote Basin is the designated black-footed ferret reintroduction area
- Focuses on maintaining 4,047 ha (10,000 ac) of white-tailed prairie dog colonies

Diamond Mountain Record of Decision (ROD)

- Maintain existing white-tailed prairie dog colonies as potential black-footed ferret habitat
- In Eight Mile Flat, new surface disturbing activities will be limited to a maximum of a cumulative total of 10% within the potential black-footed ferret habitat area
- White-tailed prairie dog occupied habitat will be allowed to expand 10% from date of ROD
- Vegetation treatments will be planned to replace Animal Unit Months (AUM) lost to white-tailed prairie dog expansion
- FW33: Authorize no action in suitable habitat for Threatened and Endangered species
- Surface disturbing activities will avoid potential black-footed ferret habitat
- If black-footed ferret habitat cannot be avoided, impact will be confined to areas with <4 burrows per hectare (<10 burrows per acre) or disturb sites not currently being used by white-tailed prairie dogs

Moab Field Office

Proposed wording for new RMP

- The white-tailed prairie dog and the Gunnison prairie dog are proposed for listing under the ESA. Should these species become listed and the BLM determines that a proposed action might affect these species or their habitat; formal or informal consultation with the USFWS will be initiated.

- Manage habitat for prairie dogs according to USFWS and UDWR recommendations and Recovery Plans
- Develop cooperative agreements with other agencies to inventory prairie dog densities and provide suitable habitat for expansion
- Protect occupied colonies. Place and protect a 0.5-mile buffer around active colonies to allow for expansion
- OHV use restricted to designated roads
- No new road development within active colonies and buffer zones
- No new oil and gas development or exploration in or within 0.5 miles of active colonies
- Adjust grazing to allow spring plant growth (livestock off by March 31)
- Ban prairie dog poisoning on BLM lands
- Develop an ACEC for the Cisco complex

The Montana policy regarding white-tailed prairie dogs is related to potential black-footed ferret reintroductions (J. Parks, BLM, personnel communication) (Appendix V). "Prior to surface disturbance, prairie dog colonies and complexes of 32 ha (80 ac) or greater in size will be examined to determine the absence or presence of black-footed ferrets." Currently Montana has only about 48 ha (118 ac) of active white-tailed prairie dog habitat and so currently the State has no conflict with oil and gas leasing. Biologists do review lease parcels and will identify any parcels involving white-tailed prairie dog colonies in order to avoid any conflicts or disturbance. Because occupied habitat in the State is so small, Montana has not encountered any conflicts to date.

Livestock Grazing

Ungulate herbivory existed within the range of the white-tailed prairie dog prior to the introduction of livestock, but it differed with respect to composition of herbivores, timing and selective pressures of grazing (Miller et al. 1994 in Crawford et al. in press). Domestic livestock grazing was instituted during European settlement in the latter 1800s, and since its establishment, it has exerted the most widespread influence on native ecosystems in western North America (Wagner 1978, Crumpacker 1984). However, evaluating the influence of domestic livestock on white-tailed prairie dog habitats and populations is problematic. Non-grazed habitats within the white-tailed prairie dog range are rare and no clear ecological benchmarks exist to evaluate changes. Also, determination of range-wide effects is difficult because the impact of grazing on ecological communities inhabited by white-tailed prairie dogs has varied depending on site potential, ecological condition, climate, timing and intensity of grazing. Overall assessments of livestock grazing throughout the west indicate that it has had profound ecological consequences including alteration in species composition within plant communities, disruption of ecosystem function and alteration of ecosystem structure (Fleischner 1984).

Alteration of plant species composition by grazing occurred due to active selection of preferred species by livestock and differential vulnerability of plants to grazing (Fleischner 1994). Livestock grazing contributed to the establishment and proliferation of exotic plant species by destabilizing plant communities, creating microsites conducive to infiltration by exotics and by dispersal of exotic seeds in fur and dung. Some of the long-term changes incurred due to grazing were changes in vegetation from predominantly grasslands to browse range (Cottam and Stewart 1940 in Collier and Spillett 1975), loss of early cool season forage and proliferation of non-native annual grasses (Crocker-Bedford 1976, Beck 1994, Young et al. 1972, 1976 in Crawford et al. in press). Alteration in plant species composition may affect the suitability of the environment for the white-tailed prairie dog by decreasing availability of forage during critical periods (e.g., as juveniles emerge, prior to hibernation, and during the reproductive season), degrading the overall quality and quantity of forage and reducing biological diversity that had historically allowed white-tailed prairie dogs to consume different plant species and parts of plants as plant phenology progressed. Ritchie (1999) found that frequency of extinction at Utah prairie dog colonies declined dramatically as the number of locally occurring plant species increased.

Disruption of ecosystem function by livestock grazing in arid environments is partly due to livestock degradation of cryptogamic crusts (Fleischner 1994). These crusts play a major role in nutrient cycling (Rychert et al. 1978), provide favorable sites for the germination of vascular plants (St. Clair et al. 1984) and are important to soil hydrology (Fleischner 1994). Research on Utah prairie dogs indicates that these changes could impact white-tailed prairie dog by affecting forage availability (Ritchie 1999).

Livestock grazing in arid areas causes the formation of deep, erosive gullies (Cottam 1961), increased soil compaction and decreased water infiltration (Kauffman and Krueger 1984, Abdel-Magid et al. 1987, Ordoho et al. 1990). The culmination of these impacts results in an altered ecosystem structure. One of the most important impacts of this alteration is the lowering of water tables leading to desertification of habitats (Fleischner 1984). There are estimates that over 1,618,800 ha (4,000,000 ac) of western rangeland have undergone desertification (Dregne 1983 in Fleischner 1994). This desertification could severely impact white-tailed prairie dogs by decreasing the availability of forage and causing a reduction in the vigor of cool season grasses.

In Utah, heavy livestock grazing within the range of the Utah prairie dog has been blamed for a marked decline in this species. Arid areas inhabited by Utah and white-tailed prairie dogs are simply not adapted to heavy grazing by large ungulates. This practice has caused a decline in occupied habitat and population densities for the Utah prairie dog (Collier and Spillett 1975). Similar impacts to the closely related white-tailed prairie dog are suspected, although unproven at present, due to lack of research.

Altered Fire Regimes

Since the 1860s, the ecological role of fire has changed dramatically within sagebrush-steppe habitats and grasslands. At lower elevation sites within the range of the white-tailed prairie dog, the most notable change has been an increase in non-native annual species and a consequent increase in fire frequencies (Crawford et al. in press). The end result of these altered fire regimes are fluctuations in herbaceous cover from year-to-year, loss of shrub cover, shortened seasonal availability of green plant material, a decrease in high quality perennial forbs and absence of forage in the late summer. In higher elevation sagebrush habitats, fire frequency has declined resulting in a subsequent expansion of woody species (shrubs and trees) and contraction of perennial forbs and grasses (Crawford et al. in press).

EVALUATION

Agricultural Land Conversion

Within the gross range of the white-tailed prairie dog, agriculture impacts 748,538 ha (1,849,612 ac) or 3.7% of the gross range (Table 6). Although white-tailed prairie dogs may not be tolerated on these lands, they represent only a small fraction of habitat within the gross range of the species and thus overall habitat loss to agriculture is significant only on a local scale and not on a range-wide scale.

Urbanization

In the gross range of the white-tailed prairie dog, few large metropolitan areas exist. Within the gross range of the white-tailed prairie dog, only 0.2% is impacted by urbanization (Table 7). Thus overall habitat loss due to this type of disturbance is significant only at a local scale and is not a range-wide concern.

Oil/Gas Exploration and Extraction

Oil and gas development is occurring at an unprecedented rate and because much of this development is occurring on BLM lands, the BLM must recognize the importance of incorporating white-tailed prairie dog management into Land Use Plans and adding it to their list of sensitive species to insure long-term, effective management of this species. Many State Field Offices currently do not consider this species in oil and gas development unless it is associated with black-footed ferret reintroduction efforts. Because of this, the BLM does not address white-tailed prairie dog species-specific needs, but addresses white-tailed prairie dog as black-footed ferret habitat. In addition, they do not address maintaining habitat for expansion and shifts in occurrence outside of currently mapped colonies and they address impacts at a colony level rather than a complex or landscape level. Finally, RMPs do not address the impact of road development and the potential for an increase in shooting/direct take of white-tailed prairie dog as a result of oil and gas development. The BLM needs to clearly designate where habitat protection will and will not be the priority and emphasis should be shifted from black-footed ferret management to management of white-tailed prairie dogs as a potentially threatened species.

Livestock Grazing

The numbers of sheep and cattle on western rangelands peaked in the early 1900s with livestock grazing centered on season-long use and stocking rates routinely exceeding carrying capacity of habitats (Cottam and Stewart 1940 in Collier and Spillett 1975, Young and Sparks 1985 *in* Crawford et al. in press). Within the last 40 years, stocking rates have been reduced by more than 25% (USDI-BLM 1990) and concurrent with these reductions, public rangelands have seen improvements (Box 1990, Laycock et al. 1996 *in* Crawford et al. in press). However, intervention is still needed to restore the ecological health of western rangelands because although improvements have occurred, the BLM still considers over 68% of the lands they manage to be in "unsatisfactory" condition (US General Accounting Office 1991 *in* Fleischner 1994). Riparian areas impacted by grazing have demonstrated rapid recovery upon removal of livestock, but xeric uplands have demonstrated less capacity for healing. In addition, most rehabilitation projects in upland habitats have focused on restoration of livestock forage rather than restoring an intact ecosystem.

Since the early 1930s grazing in white-tailed prairie dog habitats has centered on winter/spring/fall sheep grazing, but due to a declining sheep market within the last 10 to15 years, spring cattle grazing was instituted in some areas. The BLM attempts to manage grazing with the objective of providing adequate rest during the critical growing season to allow for reproduction and replenishment of plant reserves (E. Hollowed, BLM, pers. comm.). However, there is currently no formal drought management and range health assessments may not be adequate to adjust for environmental conditions and current grazing levels. For example in 2002, grazing operators held 18,142 BLM grazing permits and leases. These permits and leases allowed for as many as 12.7 million AUMs of grazing use, with 7.9 million AUMs authorized as active use and 4.8 million AUMs authorized as temporary nonuse or conservation use. In 2003, AUM usage declined to 6.9 million. This decline was the result of decreased forage growth due to extended drought, fire and other factors. This decrease in forage resulted in ranchers reducing their herds and using fewer AUMs than allowed under grazing permits and leases.

Altered Fire Regimes

A majority of the research conducted on changes in fire frequency and the effects on ecosystem function have been in the Great Basin. The arid grasslands and shrub-steppe ecosystem comprising the white-tailed prairie dog range differs from the Great Basin, and therefore direct inference of Great Basin research to white-tailed prairie dog range is questionable. Similar research efforts are needed across the range of the white-tailed prairie dog to adequately assess the effects of altered fire regimes on white-tailed prairie dog habitat.

OPTIONS FOR CONSERVATION IN A CONSERVATION STRATEGY

The ability of resource managers to address the impacts of habitat alteration, conversion and loss on the management of species at a landscape scale has improved significantly due to advanced technologies. GIS data can be used to discern the spatial pattern of suitable habitat. Knowledge of where habitat loss has and will occur on both a local and landscape scales and in what spatial patterns is crucial for proper management of white-tailed prairie dogs. Identifying habitat patches and corridors between these patches will help determine the long-term viability of local populations, probability of dispersal among populations, and areas important for conservation. Critical areas identified during these analyses must be incorporated into Land Use Plans (RMPs) with conservation actions focusing on protecting unoccupied and occupied habitat, protecting corridors for immigration and emigration and allowing maintenance and expansion of white-tailed prairie dog colonies and complexes. In addition, protection of white-tailed prairie dog habitat on private lands may be addressed by modeling private landowner incentive programs after the High Plains Partnership Initiative developed for black-tailed prairie dogs. In addition, programs such as the UDWR habitat initiative have potential to improve white-tailed prairie dog habitat.

Oil and gas development must be designed to minimize adverse iimpacts on existing white-tailed prairie dog colonies/complexes, and areas identified for expansion of colonies/complexes. To assess impacts at proposed sites, white-tailed prairie dog occupied and potential habitat should be documented prior to development. A minimal analysis should include mapping of white-tailed prairie dog suitable and occupied habitat, use of GIS to determine spatial distribution of these areas, estimate of local population densities, and evaluation of dispersal potential between suitable habitat patches within each complex, e.g., between colonies. Baseline information will help determine whether the loss of occupied and suitable habitat due to resource extraction activities could be compensated for by better managing other suitable habitat within a proposed project site and/or avoiding suitable and occupied habitat entirely and allowing development only in habitat not suitable for white-tailed prairie dog occupation. In addition, project design of oil and gas facilities in and adjacent to occupied and suitable habitat should include location of wells and roads outside of these areas, consideration of directional drilling when wells are proposed within suitable and occupied habitat, timing restrictions to vehicle travel to periods when white-tailed prairie dogs are less active and regulation of type of vehicle traffic. Guidelines should be developed to aid decision-makers in designating when and where to permit planned resource extraction and what steps must be followed to ensure long-term maintenance of white-tailed prairie dog populations. Finally, because knowledge of the effects of resource extraction on white-tailed prairie dog populations is limited, monitoring at sites before, during and after development should be required.

It is beyond the scope of this document to provide a complete review of land management practices related to livestock grazing, but the working group believes that a reevaluation of management goals and strategies on BLM public lands to improve native habitats that benefit white-tailed prairie dogs should be instituted using additions and/or amendments to Land Use Plans. In general, based on individual land manager decisions, ecological health could be improved by instituting the following practices in white-tailed prairie dog occupied areas:

1. Allow periodic rest or deferment from grazing during critical growth, seed dispersal and establishment. Fencing of high priority areas may be considered.

2. Develop grazing management practices that consider the season, duration, distribution, frequency and intensity of grazing use on areas to maintain sufficient vegetation on both upland and riparian sites to protect the soil from wind and water erosion, to assist in maintaining appropriate soil infiltration and permeability and to buffer temperature extremes. Emphasize maintenance of native plant species and natural re-vegetation to support and sustain ecological functions and site integrity. Reseeding of disturbed and burned areas should be done using native, locally adapted, plant species where appropriate.

3. Where appropriate, incorporate the use of mechanical, chemical and biological methods of weed control to manage noxious weeds.

4. Natural occurrences such as fire, drought, flooding and prescribed land treatments should be integrated with livestock management practices to move toward the sustainability of biological diversity across the landscape, including the maintenance, restoration or enhancement of habitat to provide natural vegetation patterns, a mosaic of successional stages and vegetation corridors.

Studies of fire regimes in the Great Basin do not necessarily mimic regimes on the Colorado Plateau. CDOW is currently completing a Best Management Practices guideline document for shrub-steppe and sagebrush systems, and when completed, it will include sections on fire regimes and recommendations for management of shrub-steppe and sagebrush ecosystems. These recommended conservation actions, which will be included in the Conservation Strategy, should be integrated into habitat management planning and implemented by land management agencies.

Conservation actions developed should be implemented on a range-wide scale and coordinated on a multi-State level. After conservation actions are implemented, continued long-term monitoring of white-tailed prairie dog populations should be conducted to evaluate effectiveness of programs. A monitoring protocol has been developed by Colorado State University, CDOW and UDWR (Andelt et al. 2003), and is currently being implemented in Colorado and tested in Utah. This protocol uses occupancy rate, instead of mapped occupied habitat, to monitor spatial and temporal population changes throughout the range of the white-tailed prairie dog. This methodology provides an objective, repeatable estimation technique to measure the response of white-tailed prairie dog populations to factors affecting their viability.

RESEARCH NEEDS

Studies should be conducted to identify habitat characteristics required to maintain viable populations and that address the direct and indirect effects of land conversions on white-tailed prairie dogs. Research needed to better manage white-tailed prairie dog populations includes, but are not limited to:

1. Determine the effects of timing and intensity of grazing regimes on the use of habitats by white-tailed prairie dogs.

2. Determine the positive and negative effects of agricultural land conversions on population densities, reproductive output and long-term viability.

3. Determine the effects of fragmentation and development of barriers due to urbanization and agricultural development on dispersal and maintenance of colonies.

4. Determine the spatial and temporal effects of fire on white-tailed prairie dog colonization rates and re-colonization rates.

5. Determine the difference between non-native annual grasses and native plants on population trends, reproductive output and viability over the long-term.

6. Determine the dispersal ability of white-tailed prairie dogs, affects of barriers on dispersal and types of corridors needed for dispersal to occur.

7. Evaluate changes in distribution and population densities at sites prior, during and after oil and gas development.

8. Evaluate colonization rates after wells are removed.

9. Monitor vegetation changes after wells are constructed and when they are removed.

10. Evaluate the effects of Vibroseis on white-tailed prairie dogs.

11. Examine the genetic structure of metapopulations of white-tailed prairie dogs.

2) OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC OR EDUCATIONAL PURPOSES

CURRENT INFORMATION

Shooting

Limited research exists on the affects of shooting on prairie dog populations and all of it conducted thus far has focused on black-tailed prairie dogs. Extrapolation of the data to white-tailed prairie dogs can only be inferred, but in general, the data is probably relevant. Below is a summary of studies conducted:

- Vosburgh and Irby (1998) compared 18 prairie dog colonies from 1994 to 1995 in areas protected from recreational shooting to those open to it. Colonies subjected to shooting declined by 20% (15% versus 35%) more than colonies that were not subjected to shooting and prairie dogs were more vigilant in shot colonies. The authors postulated that recreational shooting might, with additional research, be an effective management tool to limit populations but was not a viable technique to eliminate prairie dogs.

- Vosburgh (1999) compared four colonies subjected to shooting to three colonies without shooting on Fort Belknap Reservation in Montana. The number of prairie dogs declined by 20% on shot colonies and 10% on colonies without shooting.

- Knowles (1988) conducted a controlled shooting experiment on two colonies subjected to shooting and 1 that was not. The results of the study showed that shooting reduced prairie dog activity levels, and by the second year of shooting, the smallest colony had been extirpated.

- Stockrahm and Seabloom (1988) compared reproductive rates on two colonies that experienced intensive recreational shooting to two colonies that did not. They found that colonies experiencing heavy recreational shooting pressure had fewer males, smaller litter sizes and very few females breeding as yearlings. These authors suggested that shooting disrupted the social system of the black-tailed prairie dog.

- Buskirk and Pauli (2003) examined 10 black-tailed prairie dog colonies on private lands surrounding Thunder Basin National Grassland in northeastern Wyoming. The colonies were paired, one a treatment and one a control colony. Shooting events were implemented between June and mid-July. Results from this study are preliminary but so far have shown that treatment colonies exhibited reduced above ground activity, decreased foraging and sociality, juveniles experienced reduced body condition and animals on treatment plots had increased ecoparasite loads.

- Gordon et al. (2003) also examined the affects of shooting on black-tailed prairie dogs at the Thunder Basin National Grassland. They found that shooting did not appear to substantially affect black-tailed prairie dog behavior, short-term population levels or physiology. High levels of shooting did result in mass emigration from the study plot.

A review conducted by the CDOW, BLM and the USFWS (2002) described the effects of shooting closures on prairie dog populations in place at black-footed ferret reintroduction sites. The sources of information for this review included black-footed ferret allocation proposals and communication with individuals participating in reintroduction efforts. The non-quantified results of the review showed that shooting restrictions at some sites positively influenced the abundance of black-tailed prairie dogs. There were no data to adequately address shooting closures and their effectiveness on white-tailed prairie dog populations. Though shooting closures have been established in some States, there are currently no data to adequately measure their effectiveness in maintaining and/or expanding white-tailed prairie dog populations. In Utah, white-tailed prairie dog population estimates derived from black-footed ferret habitat surveys in Coyote Basin (closed) do not appear to differ significantly from similar surveys conducted in the Uintah Basin at sites that have not been closed to shooting (Table 11; Figure 7).

Shooting in white-tailed prairie dog habitats consists mainly of local shooters and not the large number of nonresidents participating in shooting of black-tailed prairie dogs (Knowles 2002). Gordon et al. (2003) found that there was a dichotomy between local and out-of-State shooters with out-of-State shooters spending more time shooting prairie dogs and using customized guns, rests and other equipment to improve their accuracy. The reason that out-of-State shooters prefer to shoot black-tailed prairie dogs over white-tailed prairie dogs is primarily due to the differences in habitats and life history of the two species. Black-tailed prairie dogs are the preferred target because colony boundaries are easily discernable, colonies have higher densities of prairie dogs, mounds are more conspicuous and the colony is generally more open and devoid of plants to obscure a shooter's vision.

Many shooters today use weapons that enable them to be consistently accurate at distances of greater than 366 m (400 yds) and to take significant numbers of prairie dogs per day. A study conducted by the BLM and Montana Fish, Wildlife and Parks indicated that the average shooter hits 60 black-tailed prairie dogs per day during 7 hours of shooting (Knowles and Vosburgh 2001). Additional studies have documented shooters discharging approximately 150 rounds per day, hitting 40 to 50 black-tailed prairie dogs and others documented shooters spending 2 to 3 days shooting and killing about 200 black-tailed prairie dogs during their visit (Vosburgh and Irby 1998, Vosburgh 1999). The Lower Brule Sioux Reservation in central South Dakota provided 8 years of black-tailed prairie dog harvest data (1993-2000) indicating that hunters shot an average of 15,000 black-tailed prairie dogs per year. Each hunter killed an average of 119 black-tailed prairie dogs per year or 38 per day of hunting (Reeve and Vosburgh 2003).

Peak shooting pressure on white-tailed prairie dog colonies tends to occur in May and June when the weather is cooler and juveniles are emerging. This timing in shooting pressure makes lactating females and young of the year more vulnerable and causes loss of dependent young when females are killed. Significant take of these individuals reduces the yearly reproductive output of a population and may be additive to natural mortality.

Lead poisoning has been suggested as an indirect consequence of shooting and a source of mortality for bird species associated with prairie dog colonies. Stephens et al. (2003) examined lead concentration in ferruginous hawk and golden eagle (*Aquila chrysaetos*) nestlings, and feather samples of burrowing owls for clinical signs of lead poisoning in Thunder Basin National Grasslands, Wyoming. They failed to detect lead poisoning in any of the raptors and concluded that low-intensity shooting does not contribute to lead poisoning, but high intensity shooting impacts remain unclear.

Commercial, Scientific, or Educational Purposes

Wild prairie dogs of all species are collected and shipped to Asian markets as part of the commercial pet trade. However, the number of prairie dogs taken from the wild for this purpose is insignificant.

EVALUATION

Shooting

Shooting closures for white-tailed prairie dogs have been implemented year-round in Coyote Basin, Utah to improve black-footed ferret habitat. In 2003, a seasonal shooting closure from April 1 to June 15 was implemented on all public lands throughout the State of Utah. Montana Fish, Wildlife and Parks and the Montana Fish, Wildlife and Parks Commission adopted a year-round shooting closure on white-tailed prairie dogs throughout their range in Montana (not including school State trust lands, private or tribal lands) beginning March 1, 2002. An extension of this closure was approved in 2003 and 2004. In both Montana and Utah, shooting closures have been well accepted by the public. In Wyoming, a permanent shooting closure was implemented on a conservation easement in the Shirley Basin/Medicine Bow Management Area covering approximately 1,917 ha (4,737 ac). In Colorado, no shooting closures have been instituted in white-tailed prairie dog habitat.

The effect of shooting on the long-term viability of white-tailed prairie dog populations is unknown because shooting can introduce a level of uncertainty in the demographics of white-tailed prairie dog populations. Coupling shooting, which can result in removal of pregnant females and young of the year, promote increased emigration and affect behavior, with population unknowns such as body size, sex and age structure, fecundity, survival rates and disease cycles, makes it impossible to predict the long-term affects of shooting on white-tailed prairie dog populations. Also the time of year that shooting takes place will have differing effects on white-tailed prairie dog populations. Shooting has the potential to locally reduce population densities and could slow or preclude recovery rates of colonies reduced by plague or other disturbances by being an additive factor to mortality. Conversely, if shooting can be managed to regulate populations and maintain them at a threshold density, it may a useful management tool for prairie dog conservation.

Commercial, Scientific, or Educational Purposes

In 2003, a black-tailed prairie dog within the commercial pet trade industry became infected with monkey pox (Department of Health and Human Services, Food and Drug Administration 2003). As a result, the Food and Drug Administration has banned all transfer of wild prairie dogs within the commercial pet trade in order to protect wild populations. Overutilization from commercial, scientific and/or educational purposes is not considered to be a threat to the long-term viability of the species.

Options for Conservation in a Conservation Strategy

Shooting

Shooting, unlike plague, is a manageable threat to prairie dogs. State wildlife agencies must develop programs to evaluate their current regulatory authorities and measures to ensure that they have mechanisms to regulate take of white-tailed prairie dogs. With the exception of Colorado, States within the range of the white-tailed prairie dog do not gather harvest information. The Colorado Harvest Program extrapolates estimates of the number of harvested prairie dogs from phone survey responses of hunters but they have no statistics on proportion of the population harvested and/or geographic areas of take, making interpretation of the influence of shooting on white-tailed prairie dog populations impossible.

Shooting restrictions should include seasonal closures when females and pups are most vulnerable (April 1-July 15) and a requirement that shooters obtain a prairie dog shooting permit. This would give State wildlife agencies, through harvest surveys, the ability to quantify annual harvest. In addition, States need to develop monitoring techniques to assess the impacts of shooting and the potential need for regulations to limit take.

Research Needs

No research has been conducted on the effects of shooting on white-tailed prairie dog distribution and population viability. Therefore research is needed to evaluate this disturbance and provide managers with information needed to regulate the take of white-tailed prairie dogs on public lands.

1. Studies comparing exploited and non-exploited white-tailed prairie dog populations should be conducted. Analysis should include effects on social interactions, foraging, distribution, emigration, population trends and reproductive output. Studies should be conducted on a large scale over an extended time period to accurately evaluate effects of this disturbance.

2. Studies should be conducted that evaluate different levels of take on white-tailed prairie dog populations. This would provide information to help manage harvest levels and timing to protect populations.

3. Development of a monitoring technique that would allow managers to adjust harvest quotas to make shooting sustainable overtime and avoid causing extinction of populations.

3) DISEASE OR PREDATION

Current Information

Disease

The primary factor limiting white-tailed prairie dog populations and distribution today is sylvatic plague, a flea-transmitted disease caused by the bacterium *Yersinia pestis* (Heller 1991, Cully and Williams 2001). Plague is a non-native pathogen that originated in Asia, arriving in North America around 1899. It was first recorded in native mammals in California in 1908 (Barnes 1982). Since then the disease has spread from the Pacific Coast, east to the 100th meridian, infecting 76 species in 6 mammalian orders (Barnes 1993). The first confirmation of plague in white-tailed prairie dogs was in Wyoming in 1936 (Eskey and Haas 1940). Today, plague-free white-tailed prairie dog populations do not exist (Biggins and Kosoy 2001b).

Susceptibility to plague varies among mammalian species, with some displaying no symptoms and acting as carriers of the disease (primary host) and others, such as prairie dogs, being highly susceptible, acting to transmit and amplify the disease (secondary host) (Barnes 1982, Cully 1997, Gage 2004). One or more primary hosts maintain plague in the environment for extended periods of time in a given geographical area (polyhostal) (Gage 2004). These host species differ in their susceptibilities to plague and the circulation of the pathogen among them may be the mechanism perpetuating plague between outbreaks (Baltazard 1960, Kalabukhov 1965, Kartman et al. 1966, Pollitzer and Meyer 1961 *in* Turner 2001). A salient and apparently universal characteristic of sylvatic plague is that it has a local (foci) and discontinuous distribution (Heller 1992). Local foci are the reservoir mechanism that perpetuates the pathogen between outbreaks (Stark 1958, Stark et al. 1996 *in* Turner 2001).

White-tailed prairie dogs have been found to experience slower rates of transmission and less consistent population declines (85%-96%) than other prairie dog species (Clark 1977, Anderson and Williams 1997). Black-tailed and Gunnison's prairie dogs experience nearly 100% mortality during epizootics and eradication of populations can occur within one active season (Lechleitner et al. 1962, 1968, Rayor 1985, Cully 1989, Cully and Williams 2001). The susceptibility of populations to epizootics is thought to be a function of high population densities in addition to abundant flea vectors, and uniformly low resistance (Biggins and Kosoy 2001a). White-tailed prairie dog populations which generally occur in low-density colonies with dispersed aggregations of animals, may experience lower transmission rates due to their spatial pattern and distribution. However, possible long-term consequences of continued plague infection on white-tailed prairie dog populations may be local extirpation of colonies, reduced colony size, increased variance in local population sizes and increased inter-colony distances.

Tularemia (*Francisella tularensis*), a native to North America, is another pathogen that can cause disease-related declines in white-tailed prairie dog populations (Davis 1935). The long-term impact of this disease on white-tailed prairie dog populations is unknown (Barnes 1982). Another new disease that may be of a concern is West Nile Virus. A black-tailed prairie

dog was reported to have died of this disease in Boulder, Colorado in 2003. The susceptibility of white-tailed prairie dogs to this disease and long-term consequences of it cannot currently be determined.

<u>Predation</u>

White-tailed prairie dogs are a prey species for many predators including black-footed ferrets, hawks, eagles, badgers (*Taxidea taxus*) and coyotes (*Canis latrans*). However, predation does not appear to exert a controlling influence on density (King 1955, Tileston and Lechleitner 1966, Clark 1977).

Evaluation

<u>Disease</u>

Research on plague during the past century has clarified certain aspects of the ecology of the disease, but many questions remain unanswered, particularly those related to how plague maintains itself in natural foci and under what conditions epizootics will occur. Without answers to these questions it is currently impossible to predict the movement, impact and/or timing of plague epizootics. In addition, information is needed to investigate the effects of changes in population demographics and recovery rates on colonies following a plague epizootic.

Recovery rates of colonies within localized white-tailed prairie dog populations have been reported to occur within as little as 1 to 2 years (Menkens and Anderson 1991, Anderson and Williams 1997) or experience little or no recovery within 10 years (Cully and Williams 2001, Little Snake, Colorado as described in document). Some of the difficulty in predicting recovery rates may be due to the continued re-infection of colonies over time and/or lack of immigration into areas. Many times when a colony begins to regain its former population size, it again becomes susceptible to plague epizootics, confounding the ability to track recovery rates (Barnes 1982). Research on the recovery rates of Gunnison's and Utah prairie dog colonies 2 years post-epizootic found Gunnison's prairie dogs experienced 100% mortality and remained depopulated (Turner 2001). The Utah prairie dog colony however, maintained 1 adult female and 11 untagged individuals after infection and the population was able to rebound to 37% of the pre-plague population of adults 2 years post-epizootic. Following the severe reduction by plague, the percent of females weaning litters and juvenile survival both increased, contributing to the recovery of the population. It is extremely important to note that immigration into the area may also be an important mechanism in supporting recovery, a factor that works against persistence of isolated colonies. The absence of immigrants into the Gunnison's prairie dog population may have been the reason for lack of colony recovery.

When evaluating the overall impacts of plague in white-tailed prairie dogs, both temporal and spatial scales are important to consider. Evaluation on a large scale, examining complexes across hundreds of square-kilometers for extended time periods, would result in a more informative portrayal of plague across the range of white-tailed prairie dogs. For example, since recovery rates appear to be quite different among localized populations and shifts in occupied habitat may occur after plague epizootics, investigation of impacts on a small scale may not adequately characterize the effect of the disease on the range-wide status of white-tailed prairie dogs. Cully (1997) found that after plague invaded an area, individual Gunnison's prairie dogs remained widely dispersed. In the following breeding season however, remaining individuals aggregated into new colonies that expanded into suitable habitat. Biggins (2003b) also observed this pattern at Meeteetse, Wyoming. In Shirley Basin between 1991 and 2001, the number of prairie dog colonies on a monitored portion of the complex declined from 14 to 11, but the associated occupied hectares increased during that same period from 4,894 ha (12,092 ac) to 5,814 ha (14,366 ac) (Grenier 2002). Conversely, Seery (2004) found that during and after a plague epizootic, the number of black-tailed prairie dog colonies increased while the amount of occupied habitat declined.

Evaluation of plague over longer time periods may provide better insight into how white-tailed prairie dog populations are able to cope with this introduced pathogen. Environmental stochastic events and anthropogenic disturbances in combination with plague could ultimately decrease the ability of a population to recover to historical densities and jeopardize the long-term persistence of white-tailed prairie dog populations. In addition, a loss of genetic diversity due to periodic population bottlenecks caused by epizootics may occur. White-tailed prairie dogs have been found to have lower genetic variation than either black-tailed prairie dogs or ground squirrels and reduced gene flow between populations could be a concern (Cooke 1993).

There is evidence that some mammalian species are evolving a reduced susceptibility to plague (Williams et al. 1979, Thomas et al. 1988 in Cully 1993). Resistance to plague may differ among populations of the same species, and it may change depending on amount of exposure (Biggins and Kosoy 2001b). Antibody titers have been found in Utah, Gunnison's and white-tailed prairie dogs indicating individual exposure to plague and subsequent recovery (Cully and Williams 2001, Biggins 2003a). The long-term consequence of repeated exposure to plague in white-tailed prairie dogs may lead to selection of individuals that are genetically more resistant to the disease and are able to maintain plague in an enzootic form in the environment. However, populations of while-tailed prairie dogs thus far have remained highly susceptible to plague even after being subjected to repeated exposure (Biggins and Kosoy 2001b).

Plague will likely continue to be an ever-present threat throughout the range of the white-tailed prairie dog in the foreseeable future. White-tailed prairie dog responses to plague epizootics have not been intensively studied, but at the complex and possibly the colony level, they have been found to survive plague epizootics better than other prairie dog species (Clark 1977, Anderson and Williams 1997). One reason for this could be that transmission rates of plague are density dependent (Cully 1989) and because white-tailed prairie dogs occur at lower densities, transmission may be slowed or stopped before it affects the entire colony or complex. While these "characteristics" may prove to aid white-tailed prairie dogs in maintaining population numbers in the face of plague, dramatic die-offs of 85% or greater will over the long-term negatively impact white-tailed prairie dog populations. Biggins (2003b) also states that though detection of both declines and increases seems to suggest that white-tailed prairie dogs are not in imminent jeopardy of extinction, their ecological function has been impaired by the introduction of plague.

Human actions may compound the impacts of plague, at least in the short term, and should be addressed where possible to lessen the impacts or duration of plague. The effects of plague may be amplified and recovery rates slowed when additional stresses such as shooting, poisoning and habitat loss/conversion occur. All of these pressures acting together may exacerbate isolation of white-tailed prairie dog populations. If plague infiltrates isolated areas and localized populations are eradicated, source animals may not be present to re-colonize the area.

Predation

Although white-tailed prairie dogs are susceptible to predation from a wide array of sources, predation is not believed to be limiting populations and is not currently believed to be significant threat to the long-term viability of the species. Only the black-footed ferret preys exclusively on prairie dogs. Other predators are known to utilize a wide array of prey species and are generally opportunistic prairie dog predators.

Considerations for the Conservation Strategy

Disease

The effect of plague on the long-term viability of white-tailed prairie dogs is unknown. Currently there are no techniques available for effective control or management of plague on large scales because the ecology of plague differs between habitats, populations and prairie dog species and because current methods are costly and labor-intensive. Flea control can be used successfully on small scales (D. Biggins, USGS, personnel communication). An integral part of managing this disease and protecting white-tailed prairie dog populations will be to understand the range-wide dynamics of plague. Technologies that may be useful in doing this will include GIS/Remote Sensing, population and climate modeling.

The long-term impact of tularemia on white-tailed prairie dog populations is unknown (Barnes 1982) but is not considered a significant threat to the long-term viability of the species. The susceptibility of white-tailed prairie dogs to West Nile Virus and the long-term consequences of the disease cannot be currently determined.

Predation

As previously stated, white-tailed prairie dogs are susceptible to predation from a wide array of sources, but predation is not believed to be limiting populations nor a significant threat to the long-term viability of the species. Therefore, no action is necessary to address predation as a threat.

Research Needs

1. Determine what happens to the disease between epizootics (maintenance mechanisms).
2. Determine the role of associated mammals in the maintenance and transmission of plague.
3. Further examine under what conditions the disease is likely to flare up (e.g., climate).
4. Examine flea biology including ability to reproduce during epizootics, depression of flea numbers after an epizootic, time to recovery for fleas.
5. Evaluate ramifications of plague to long-term persistence of white-tailed prairie dog populations at a landscape scale.
6. Examine recovery rates and population dynamics in infected colonies.
7. Determine consequences of inbreeding depression in recovering colonies.
8. Evaluate metapopulation dynamics - dispersal/movement, colonization, gene flow.
9. Institute a plague monitoring protocol to document plague events annually and maintain a range-wide database similar to that recommended for the black-tailed prairie dog (Luce 2003).
10. Continue research to develop an oral plague vaccine that can be economically dispersed over large areas occupied by white-tailed prairie dogs.
11. Continue research on using dusting with pesticides for flea control as a management tool. White-tailed prairie dog colonies with plague have been found to have both a higher percentage of burrows infested with fleas and a greater number of fleas per infested burrow than plague free colonies, indicating that fleas may drive the cycle (Heller 1991).

4) INADEQUACY OF EXISTING REGULATORY MECHANISMS

Current Information

All States within the range of the white-tailed prairie dog classify it as a pest and permit poisoning and killing year long on private lands. Wyoming classifies the white-tailed prairie dog as a Nongame Species of Special Concern with a Native Status Species of 4 (NSS4). Take is unrestricted. Poisoning on private lands in Wyoming is currently limited to reduction of occupied hectares or limiting colony expansion rather than colony elimination (R. Reichenbach, Wyoming Dept. of Agriculture, pers. comm.). The situation is similar in Utah, Montana and

Colorado, with a large percentage of the poisoning in Colorado attributed to either control adjacent to agricultural areas or where urban expansion is taking place. Montana has a Conservation Plan that includes both black-tailed and white-tailed prairie dogs and, with the Montana Natural Heritage Program, has designated the species S1 (critically imperiled) on the Species of Concern List. In Utah, UDWR added the white-tailed prairie dog to its Sensitive Species List in 2003. For species placed on this list, management programs are to be developed to proactively prevent listing of the species under the ESA.

The BLM manages the bulk of the white-tailed prairie dog habitat and currently State Field Offices do not manage this species unless it is associated with black-footed ferret reintroduction efforts. Thus, the BLM does not address white-tailed prairie dog species-specific needs, but only addresses the white-tailed prairie dog as black-footed ferret habitat. Implementation of land management actions on public lands across the State of Wyoming vary somewhat from office to office. A number of prairie dog colonies, and some major complexes, are intermingled with oil and gas development and production activities. However, most Field Offices do not afford prairie dogs any special management status, although to the extent deemed reasonable, most offices attempt to avoid prairie dog colonies, and particularly complexes, with surface disturbing activities. The terms and conditions, and conservation measures, resulting from ESA Section 7 consultations with the USFWS for other species sometimes dictate the actual prairie dog management measures applied (e.g., distance setbacks from colonies, monitoring, etc.). Some offices attach lease notices to oil and gas leases, and some offices apply conditions of approval. The BLM in Wyoming has issued limited policy for black-tailed prairie dog management (IM No. 99-146, IM No. WY-2000-46, and IM No. 2000-140), and some of this policy instruction has been carried over to white-tailed prairie dogs where it regards commercial hunting activities, shooting and use of rodenticides for animal damage control.

Small amounts of white-tailed prairie dog habitat can be found on National Monuments, National Recreation Areas, Wildlife Refuges and USFS lands where management of this species is not addressed. However, poisoning is either banned or closely controlled.

Shooting is not addressed by current Federal regulations on Federal lands. The CDOW and the WGFD permit unlimited shooting of white-tailed prairie dogs year-round. Utah recently implemented a shooting closure on public lands from April 1 to June 15 and Montana has a year-round shooting closure on white-tailed prairie dogs on public lands (not including school State trust lands).

Evaluation

On Federal lands, impacts due to shooting, oil and gas development, livestock grazing, road development, poisoning and mineral extraction are not addressed by current regulations. However, protection from conversion of habitat to agriculture and urbanization is afforded. In areas where black-footed ferrets have been reintroduced, programs are in place to monitor white-tailed prairie dog populations in order to protect black-footed ferret habitat.

The Wyoming Game and Fish Commission and the WGFD recently reviewed existing regulatory regulations that address both the white-tailed and black-tailed prairie dog and agreed that current regulations would allow the Commission to implement a shooting closure if necessary for conservation of the species. The Commission and WGFD concur that existing data does not warrant a Statewide shooting closure at this time. As stated previously, Montana recently completed a Conservation Plan for black-tailed and white-tailed prairie dogs and has a seasonal shooting closure in effect. Utah has implemented a seasonal shooting closure on public lands. Colorado is the only State that has proactively addressed shooting by conducting shooter harvest surveys to establish the level of take. To date Colorado has not implemented a shooting closure.

Options for Conservation in a Conservation Strategy

State and Federal agencies should review and evaluate current laws and regulations regarding white-tailed prairie dogs. State wildlife agencies and the BLM should cooperate on the development of the new RMPs to address the conservation of white-tailed prairie dogs and their habitat with regard to oil and gas development, livestock grazing, poisoning, shooting and road development. Special protection for large white-tailed prairie dog complexes should be employed by designating them as ACECs or "special management areas" on public lands. Standardized range-wide monitoring and management strategies for white-tailed prairie dog colonies and complexes, other than those associated with reintroduction of black-footed ferrets, should be implemented to measure and potentially mitigate the impacts of disturbances. Research addressing many of the issues associated with white-tailed prairie dog biology, ecology and responses to disturbances should be funded. Coordination with private land holders to protect and promote colonization on private properties should be instituted. Mitigation options for development in areas currently occupied by white-tailed prairie dogs and design and implementation of translocation program, primarily in Montana, should be explored.

Research Needs

1. Develop a range-wide technique to monitor white-tailed prairie dog distribution and rate of occupancy.

2. Refine habitat suitability models on a State-by-State basis to better manage white-tailed prairie dog habitat.

5) OTHER NATURAL OR MANMADE FACTORS AFFECTING ITS CONTINUED EXISTENCE

Current Information

Poisoning

As early settlement of the Intermountain West occurred, control of mammalian species considered "vermin" became common practice. Prairie dog species became the focus of widespread eradication efforts largely as a result of their reputation as range and agricultural pests (Clark 1989). The Biological Survey initiated systematic prairie dog control programs in

1915, and by 1919, cooperative poisoning campaigns had begun in all four States where the white-tailed prairie dog occurs (Table 20). The majority of the poisoning effort was targeted at black-tailed prairie dogs, but major efforts were also expended to eliminate the Wyoming ground squirrel (*Spermophilus elegans*), causing indirect poisoning of white-tailed prairie dogs. In portions of their range, the white-tailed prairie dog was specifically targeted for eradication. After the 1970s some toxicants (e.g. strychnine and 1080) previously used for prairie dog control were banned, and although prairie dog control continues today, it occurs at a reduced rate with less effective toxicants. Broad-scale control programs essentially remove all animals from the treated area and directly contribute to vegetation changes that may limit future re-colonization, as has proven to be the case for the black-tailed prairie dog (Van Pelt 1999). Populations are impacted at a landscape level if control is 100% effective, not only directly, but because immigration sources are removed, genetic exchange is obstructed and susceptibility to stochastic events are magnified.

Between 1903 and 1912 efforts to exterminate prairie dogs in Colorado were initiated primarily by individual cattlemen (Clark 1989). Organized State-wide efforts began with the Pest Inspection Acts of 1911 and 1915. In 1912, the first systematic efforts of eradication began with nearly every part of the state of Colorado being treated at one time or another with most parts being poisoned annually (Clark 1989). Between 1923 and 1958, rodent control records reported that from 65 to 41,057 ha (160 to 101,450 ac) of Wyoming ground squirrels were treated annually (Wolf Creek Work Group 2001). This poisoning most likely impacted white-tailed prairie dogs as well. Between 1935 and 1957 up to 22,428 ha (55,420 ac) of prairie dogs were controlled annually State-wide by the Civilian Conservation Corps at Elk Springs, Massadona and Sunbeam. From 1958 to the present, records were not kept. Prairie dog control was conducted throughout the lower White-River Valley, Massadona and Elk Springs, including Wolf Creek and Coyote Basin Management Areas from 1935 to 1942.

In Utah, poisoning to eliminate the Utah prairie dog began in 1920. This poisoning program was successful at reducing Utah prairie dogs from approximately 37,232 ha (92,000 ac) in 1920 to 971 ha (2,400 ac) in 1971 (Collier and Spillett 1975). Though little poisoning information for the white-tailed prairie dog is available for this time frame, similar reductions likely occurred.

Prairie dog control programs began in the 1880s near Meeteetse, Wyoming (Edgar and Turnell 1978) and continued sporadically in the State until the 1930s. Kill rates were estimated at 50 to 100% during Federal poisoning programs (Tietjen 1976 in Clark 1986). Limited poisoning after the 1930s suggested that this campaign was effective at eliminating a majority of prairie dogs. The poison 1080 was introduced in 1946 and became very effective and popular. Clark (1989) summarized the poisoning program in Wyoming from 1966 to 1972. During this period an average of 33,860 kg of strychnine-poisoned grain, 4,730 kg of 1080 and 39,401 gas bombs were used annually on an average of 27,140 ha (67,062 ac).

In Montana, historic prairie dog declines are partially attributed to intensive eradication programs (Anderson et al. 1986). The Biological Survey Program for rodent control was used in Montana from 1916 to 1940 (Montana Prairie Dog Working Group 2002). Use of the compound 1080 was initiated in 1948 and tapered off after 1974.

Drought

Annual moisture is thought to be one of the most important factors influencing the distribution of Utah prairie dogs (Collier and Spillett 1975). Drought conditions produce negative effects on plant cover and vegetative moisture (Collier and Spillett 1975). Studies have found that Utah prairie dogs on productive, wet sites have greater body mass, higher population densities and faster expansion rates (Crocker-Bedford and Spillett 1981, Collier 1975). White-tailed prairie dog colonies located on sites lacking sufficient quality and quantity of vegetation may have a difficult time obtaining adequate nutrition and water resulting in animals spending less time foraging and longer periods in aestivation. White-tailed prairie dogs have been found to graze preferentially on watered plots and were more active on these plots than on unwatered ones (Beck 1994). Higher quality habitats also promoted higher weaning success for both adult and yearling female white-tailed prairie dogs (Cooke 1993).

The effects of drought have been amplified within the past century due to land use practices that have resulted in the invasion of non-native plant species, alterations in plant species composition and lowering of water tables. The proliferation of exotic annual weeds over native perennial grasses and forbs may impact the ability of white-tailed prairie dogs to meet their dietary needs especially during drought years (Ritchie 1999). This is because these invasive species may not provide sufficient above or below ground forage or water stores which white-tailed prairie dogs need to subsist. They also out-compete and eradicate native species with which white-tailed prairie dogs have evolved. Utah prairie dog colony extinction rates have been found to increase as the number of locally occurring plant species declined (Ritchie 1999). Because much of the white-tailed prairie dog range occurs in arid shrub-steppe habitats, prolonged drought may have serious adverse impacts on white-tailed prairie dog populations by lowering animal body condition resulting in lower overwinter survival rates, lower reproductive output and increased rates of parasitism.

Evaluation

Poisoning

Assessing the extent of poisoning on white-tailed prairie dogs in the past is difficult because the accounts of poisoning are not usually site or species specific. Black-tailed prairie dogs were the main focus of eradication campaigns, but white-tailed prairie dogs were targeted, directly and indirectly. Poisoning became less common after the 1970s due to Federal regulation of poisons. Poisoning on private lands still continues today, but is often used for containment rather than large-scale eradication. Only toxicants registered by the EPA may be legally used to control prairie dogs.

Knowles (1982) and Apa et al. (1990) found that black-tailed prairie dogs were able to recover from poisoning within a relatively short time frame due to an increase in the intrinsic rate of growth. For example, colonies reduced by 45% were able to rebound within 10 months while those completely controlled required 5 years or more to return to pre-control densities. These data provide evidence that if black-tailed prairie dogs are protected from landscape-scale eradication efforts that they can rebound, implying similar potential for the white-tailed prairie dog. Long-term impacts to white-tailed prairie dogs and their habitats from poisoning are unknown, and may or may not mimic the black-tailed prairie dog. The Wyoming Game and Fish Commission and Wyoming Department of Agriculture are currently developing a Memorandum of Understanding that would allow the State to curtail or halt toxicant application in Wyoming for either the short-term or long-term if necessary in order to effectively manage the white-tailed prairie dog. Colorado, Utah and Montana are not considering this approach at the current time.

Drought

White-tailed prairie dogs have evolved to live in arid areas that experience periodic droughts. However, livestock grazing throughout the west has had profound ecological consequences including alteration in species composition within plant communities, disruption of ecosystem function and alteration of ecosystem structure (Fleischner 1984). Because of this, white-tailed prairie dogs may not be able to survive prolonged drought conditions as well as they did historically. Also due to global warming, the number and duration of drought conditions may be increasing making it more difficult for white-tailed prairie dogs to survive. Thus, drought may be a significant factor limiting white-tailed prairie dog distribution and affecting population trends.

Options for Conservation in a Conservation Strategy

Poisoning

Ultimately, poisoning must be managed either by the State wildlife agency or State department of agriculture if regulation of take of white-tailed prairie dogs is to become a reality. These entities need to have the authority to limit or prohibit take by poisoning. The development of incentive programs to motivate private landowners to maintain white-tailed prairie dog colonies on their lands should also be advocated. Translocation options to supplement existing complexes and colonies or create new ones and/or rescue individuals from colonies threatened with imminent destruction could be incorporated into management plans to help maintain or recover population densities.

Drought

Climate conditions negatively impacting prairie dogs are difficult to manage on a site-specific basis, but perhaps can be addressed on a range-wide scale through multi-State cooperation and planning. GIS data layers could be used to rate sites on their ability to sustain white-tailed prairie dogs during times of drought based on the composition of vegetation and location of the habitat. Areas that are composed of native/nutritious vegetation would be considered to be at less risk than those occupying areas predominated by a greater proportion of cheatgrass or other vegetation less suitable to white-tailed prairie dog survival and productivity. This would aid land managers in focusing their energies in improving high risk areas by better managing timing and intensity of grazing to promote forb and perennial grass production, control invasive weeds and restoration of the historical density of woody species. Also managers could work to alleviate additional stressors such as shooting, which may impact the amount of time a white-tailed prairie dog spends foraging, to help during times of unfavorable environmental conditions.

Research Needs

Information is needed to provide better management decisions regarding land use practices such as grazing, habitat restoration and resource extraction. These data will aid in design of management strategies that alleviate additive stresses during difficult environmental conditions and provide information on when poisoning may be warranted and what level of control will be adequate to address the concerns.

1. Monitor white-tailed prairie dog populations during various environmental conditions over a significant part of the range.

2. Examine land use practices and their ability to influence white-tailed prairie dog responses to environmental changes.

3. Work on developing non-lethal options for controlling white-tailed prairie dogs.

4. Examine the ability of white-tailed prairie dog populations to rebound after use of poisons on colonies.

THE WORKING GROUP'S RECOMMENDATION REGARDING THE NEED TO LIST THE WHITE-TAILED PRAIRIE-DOG AS THREATENED UNDER THE ESA:

The White-tailed Prairie-Dog Working Group of the 12-State Prairie-Dog Conservation Team has examined the data presented in this Conservation Assessment and evaluated whether or not it provides sufficient justification for listing the white-tailed prairie dog as threatened under the ESA. Based on the data, the Working Group does not support listing at this time. The Working Group believes the following factors argue against the need to list:

1) PRESENT OR THREATENED DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

Agricultural Land Conversion

Neither past nor current levels of land conversion rise to the level of a threat to the continued existence of the species over a significant portion of its range in the foreseeable future, and therefore does not justify listing under the ESA. Loss of habitat due to agricultural land conversion occurred historically, but at a relatively low level. Data presented in Table 6 do not indicate that a significant portion of the range in any individual State is impacted, and current trends in agricultural land conversion discussed in this Conservation Assessment do not suggest this impact is likely to increase in the foreseeable future.

Urbanization

This impact does not rise to the level of a threat to the continued existence of the species over a significant portion of its range in the foreseeable future, and therefore does not justify listing under the ESA. Data presented in Table 7 show that less than 1% of the gross range is impacted by urbanization. Loss of habitat due to urbanization is almost exclusively localized in the area of Grand Junction, Colorado. Throughout the remainder of the range it is a very minor impact.

Oil/Gas Exploration and Extraction

This impact has the potential to rise to the level of a threat to the continued existence of the species over a significant portion of its range, and therefore has the potential to justify listing under the ESA in the foreseeable future. Oil and gas exploration is occurring at a phenomenal rate on public lands. Since the BLM owns and manages 55% of the land in the predicted range of the white-tailed prairie dog, significant impacts are possible, primarily during development of oil and gas fields with close well spacing and associated roads. As stated previously in this Conservation Assessment, recent data from Colorado, Wyoming and Utah indicate that white-tailed prairie dog complexes shift on a landscape scale, possibly in response to plague or other factors not currently identified. Therefore all suitable habitat within and adjacent to complexes must be protected from direct habitat loss on a landscape scale if expansion opportunities are to be retained. Current BLM policies do not adequately protect white-tailed prairie dogs during oil and gas development. With the increased amount of leasing and oil and gas development in the white-tailed prairie dog range (77% of the white-tailed prairie dog range in Wyoming has the potential to be impacted by oil and gas development) this could lead to the need for listing the species under the ESA. Revision of BLM Land Use Plans to control leasing and development in white-tailed prairie dog complexes to address prairie dog management needs and maximize habitat potential must be initiated on a State-by-State basis to prevent further, more drastic actions, including listing the white-tailed prairie dog under the ESA.

Livestock Grazing

Livestock grazing has negatively impacted the white-tailed prairie dog range by disrupting the ecosystem and drastically altering the landscape. Many of the changes brought about by this practice will continue to impact the white-tailed prairie dog such as the presence of non-native annuals, increased shrub cover, loss of cool season grasses and lowered water tables. This impact could rise to the level of a threat to the continued existence of the species over a significant portion of its range. However, as stated previously in this Conservation Assessment, the BLM manages 55% of the white-tailed prairie dog predicted range and has been working to reduce stocking rates. Though improvements have been made, upland habitats are difficult to restore and currently, options for their restoration are lacking. Information is needed to clearly evaluate the effects grazing practices have on white-tailed prairie dog populations. Until this information is made available the influence of this altered landscape on the population status and viability cannot be determined.

Altered Fire Regimes

This impact does not rise to the level of a threat to the continued existence of the species over a significant portion of its range in the foreseeable future, and therefore does not justify listing under the ESA. No evidence exists that there is a significant impact to white-tailed prairie dogs from altered fire regimes.

2) OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC OR EDUCATIONAL PURPOSES

Shooting

Shooting does not rise to the level of a threat to the continued existence of the species over a significant portion of its range, and therefore does not justify listing under the ESA. Shooting, if managed correctly, is not a threat that will significantly limit the distribution of the white-tailed prairie dog, or a threat that will adversely affect population size and density such that recovery cannot be achieved in subsequent years. However, it is a threat that may act in conjunction with other threats to slow or preclude recovery rates of colonies reduced by plague or other disturbances.

Currently, there is a lack of scientific data suggesting that shooting has a significant impact on the viability of white-tailed prairie dog populations. Anecdotal information and field observation by State and Federal biologists suggest that impacts are not widespread or significant. In addition, in States that have both black-tailed and white-tailed prairie dogs, biologists are unanimous in their opinion that shooting is of longer duration and more intense on black-tailed than on white-tailed prairie dog colonies. Therefore, we consider it to be significant that in the 2002 Black-tailed Prairie Dog Candidate Assessment, the USFWS stated "we are not aware of data that support a conclusion that reductions in density are sufficient to reduce population persistence at a given site," and that "no information is available that demonstrates that any black-tailed prairie dog population has been extirpated or nearly extirpated by this activity." The USFWS's conclusion was that for the black-tailed prairie dog, the effects due to shooting do not rise to the level of a threat pursuant to the definitions and constraints of the ESA. The best data available to the State wildlife agencies in the range of the white-tailed prairie dog, and Knowles (2002), indicate it is reasonable to assume that the situation is at least similar, if not less threatening, for the white-tailed prairie dog.

3) DISEASE OR PREDATION

Disease

Sylvatic plague has the potential to rise to the level of a threat to the continued existence of the species, but the threat is non-imminent. Concern over the long-term viability of white-tailed prairie dog populations is warranted. However, current available population trend and occupied hectare data do not show that this species is in imminent danger of extinction due to plague. It does appear that individual colonies and complexes are prone to significant declines during epizootics, but some colonies/complexes also exhibit rapid recovery. Thus, there is significant temporal and spatial variation in size of colonies and densities of white-tailed prairie dogs within colonies. Populations across the range may or may not occur at lower densities than they did historically, but the fact remains that they are continuing to maintain populations even when faced with plague. The role that plague has played and will play in the overall decline of white-tailed prairie dogs is a critical question for future management and research. Plague remains the unknown factor in the equation for conserving the white-tailed prairie dog. Though work is being conducted on the ecology of the disease and possible oral vaccine development, managing for the effects of plague epizootics will be an immense challenge for resource managers and scientists.

The biggest concern is that the ecosystem as a whole is not as productive as it was historically. Research presented in this Conservation Assessment indicates that continued re-infection by plague may be the reason that colonies and complexes show such dramatic oscillations in densities and spatial variation in occupied habitat. Prior to the introduction of disease, populations may have been more stable and provided a reliable prey source for such species as ferruginous hawks and a specialized predator like the black-footed ferret. With populations now more dynamic, there is concern over the viability of species dependent on white-tailed prairie dog populations, therefore it is imperative that the approaches to plague management presented in this Conservation Assessment be implemented by State and Federal agencies.

<u>Predation</u>

No scientific evidence exists to indicate that predation at the level currently experienced limits white-tailed prairie dog populations or distribution.

3) INADEQUACY OF EXISTING REGULATORY MECHANISMS

The Working Group believes that current regulatory mechanisms of both State and Federal agencies should be improved to help conserve the white-tailed prairie dog. The development and implementation of appropriate management actions such as developing accurate survey techniques, incorporating progressive grazing and fire management especially during times of drought, incentive programs for private landowners, long-term monitoring of populations, and public outreach and education will all contribute to the long-term viability of this species. The BLM must also consider the white-tailed prairie dog in their Land Use Plans. Shooting seasons should be implemented. Plague monitoring should be instituted and research funded. The majority of the white-tailed prairie dog range is on public lands and agencies need to develop conservation strategies for this species if it is to remain off the ESA. It will also be imperative that conservation programs for this species take into account the interests of all affected parties so that alienation of segments of populations or stakeholders such as private and public land ranchers does not occur. Successful preservation of this species will require involvement by tribal, State, Federal, private and local parties that agree to participate in the conservation effort.

4) OTHER NATURAL OR MAN-MADE FACTORS AFFECTING ITS CONTINUED EXISTENCE

Poisoning

The Working Group does not believe that poisoning is a threat to the continued existence of the species, and therefore does not justify listing under the ESA. Control by poisoning on BLM lands, which contain 55% of the predicted range, is currently banned. Data presented in this Conservation Assessment indicate that poisoning is mostly a threat near cultivated or irrigated agricultural areas. In addition, the Working Group believes that less poisoning takes place in the white-tailed range than in the black-tailed prairie dog range. Therefore, the USFWS's 2002 Candidate Assessment for the black-tailed prairie dog, which considers the threat to be moderate but non-imminent for the black-tailed prairie dog, supports the supposition that it is also non-imminent for the white-tailed prairie dog.

Drought

The Working Group does not believe that drought is a threat to the continued existence of the species, and therefore it does not justify listing under the ESA. In the State sections of the Conservation Assessment no pattern emerged within the population analysis to account for the affects of drought. For example in Utah during the 6 years of drought, some populations have declined as others increased. In Colorado, Wolf Creek east has remained relatively stable, whereas Wolf Creek West declined and then began to increase at the same time Utah populations were declining. In Wyoming, Shirley Basin increased occupied habitat by 50% in 2004. If drought alone was driving these fluctuations, assuming widespread drought, all populations would be following the same cycle and this does not appear to be the case. The working group does believe that drought can negatively impact white-tailed prairie dog populations and the differences observed between areas may be due to habitat quality. If land managers can work to improve habitat conditions within the range of the white-tailed prairie dog, the negative affects of drought can be lessened.

CONCLUSION

After careful analysis of the information presented in this Conservation Assessment, the White-tailed Prairie Dog Working Group of the 12-State Prairie Dog Conservation Team believes that while active management and development of conservation strategies for the species and its habitat is needed, justification does not exist for listing the white-tailed prairie dog as threatened under the ESA at the current time. However, the threat posed by oil and gas exploration and extraction could justify listing unless it is immediately addressed on public lands managed by the BLM. It is critical that the BLM through its Land Use Plans, manage oil and gas leasing and development in white-tailed prairie dog complexes to maximize prairie dog habitat potential. Land Use Plans must be revised on a State-by-State basis and white-tailed prairie dog protection initiated in order to prevent further, more drastic actions, possibly including listing the white-tailed prairie dog under the ESA.

The threat posed by plague could also justify listing. The reason that some occupied habitat has declined and not recovered (e.g. Little Snake, Colorado; Meeteetse, Wyoming; Cisco, Utah) is unknown. Continued re-infections may ultimately decrease the ability of a population to recover to historical densities and occupied habitat levels. The Working Group recognizes that plague may be the primary cause of large fluctuations in population densities that could lead to extermination on a landscape scale if additive impacts from a variety of sources combine with plague. Therefore, the Working Group believes that State wildlife agencies should continue to explore agreements to monitor plague on a range-wide scale, reduce and eliminate impacts from other anthropogenic sources and encourage research on ways to control plague.

Other potential impacts will be addressed in the Conservation Strategy to prevent them from rising to the level of a threat. These include:

1) BLM, through Land Use Plans revision, must manage grazing on white-tailed prairie dog habitats so that adequate rest occurs during the critical growing season to allow for reproduction and replenishment of plant reserves such that lack of quantity and quality of forage does not become an additive impact to the impacts of plague, shooting, poisoning and oil/gas exploration and extraction. In addition, all practices need to be revised and monitored during times of drought to ensure that the habitat is not being further degraded during these extreme environmental conditions.

2) Although the Working Group believes that shooting alone is not a threat that significantly limits the distribution of the white-tailed prairie dogs on a landscape scale, State wildlife agencies should continue to explore options and/or regulations to establish shooting closures to prevent take during the breeding and whelping season. States should also measure the level of take by implementing harvest surveys.

3) Data presented in this Conservation Assessment indicate that poisoning is mostly a threat near cultivated or irrigated agricultural areas, but State wildlife agencies should continue to work to acquire adequate regulatory authority for conservation of white-tailed prairie dogs by establishing through law, regulation or cooperative agreement the ability of the State to limit or prohibit take by poisoning if necessary. To address the threat to the species posed by unregulated poisoning, the States must not only have the regulatory authority, but also be willing to use it. In addition, State wildlife agencies and other interested parties should continue to pursue laws or regulations to require reporting amount and location of use of toxicants by control agencies so amount and location of toxicant use can be tracked on an annual basis. Control by poisoning should continue to be banned on BLM lands, which contains the bulk of the gross and predicted range.

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Table 1. Estimate of white-tailed prairie dog occupied habitat per State and hectares within gross range and predicted range of each state based on the Predicted Range Model.

State	Estimate of Occupied Habitat[a]	White-tailed Prairie Dog Gross Range[b] (ha)	% of Gross Range[b]	White-tailed Prairie Dog Predicted Range[c] (ha)	% of Predicted Range[c]
Colorado	96,669	4,213,595	21	1,470,390	11
Montana	48	181,663	0.9	111,694	0.9
Utah	57,765	3,200,492	16	1,693,108	13
Wyoming	185,988	12,629,083	62	9,791,694	75
Total	**340,470**	**20,224,807**		**13,066,887**	

a. Colorado, Montana and Utah white-tailed prairie dog habitat estimates are from the most current statewide surveys (2002-2003). Wyoming estimates of white-tailed prairie dog occupied habitat are from mapping of statewide complexes pre-1995.

b. Gross range is the outer boundary identifying white-tailed prairie dog distribution and does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

c. The predicted range was developed from a GIS model to depict a more accurate, spatial range of the white-tailed prairie dog. This model does not imply that the area could be or is appropriate for white-tailed prairie dog occupation.

Table 2. NLCD Landcover classes found to be suitable and not suitable for development of the Predicted Range Model.

NLCD Land Cover Classification System Key - Rev. 20 July 1999	
Open Water	Not Suitable
Perennial Ice/Snow	Not Suitable
Low Intensity Residential	Not Suitable
High Intensity Residential	Not Suitable
Commercial/Industrial/Transportation	Not Suitable
Bare Rock/Sand/Clay	Not Suitable
Quarries/Strip Mines/Gravel Pits	Not Suitable
Transitional	Not Suitable
Deciduous Forest	Not Suitable
Evergreen Forest	Not Suitable
Mixed Forest	Not Suitable
Shrubland	Suitable
Orchards/Vineyards/Other	Not Suitable
Grasslands/Herbaceous	Suitable
Pasture/Hay	Not Suitable
Row Crops	Not Suitable
Small Grains	Not Suitable
Fallow	Not Suitable
Urban/Recreational Grasses	Not Suitable
Woody Wetlands	Not Suitable
Emergent Herbaceous Wetlands	Not Suitable

Table 3. White-tailed prairie dog population analysis determined from surveys evaluating suitability of habitat for black-footed ferrets at Wolf Creek Black-footed Ferret Management Area, Colorado.

Year Surveyed		Size (ha)	% of Good Habitat [i]	White-tailed Prairie Dog/ha Good Habitat[j]	Population Estimate for Good Habitat	White-tailed Prairie Dog/ha for Entire Area Sampled	Population Estimate for Entire Area Sampled
1989/90 (BLM/FWS)[a]		11,426	42	6.3	30,102	--	--
1993/94 (CDOW)		6,830	87	7.4	43,967	--	--
2000 (USU/BLM) [b]		3,998	56	7.7	17,274	4.9	19,719
2001 (USU/BLM) [c]		2,823	37	7.5	7,782	3.7	10,331
2002	Total[d]	5878	38	6.6	14,846	3.2	18,843
	West[e]	4,050	18	5.5	3,922	1.8	7,266
	East[f]	2,840	30	6.5	5,554	2.9	8,212
	East[g]	1,828	83	7.2	10,924	6.3	11,576
2003	Total[h]	5,878	41	6.8	16,564	3.4	19,968
	West[e]	4,050	23	6.8	6,275	2.3	9,214
	East[f]	1,828	83	6.8	10,289	5.9	10,754

a. The 1989/90 data was derived from mapping that included all lands showing evidence of white-tailed prairie dog occupation, past and present. Subsequent mapping was more selective and did not include inactive sites.

b. Transecting conducted by USU/BLM crew. Transecting was completed on the west side of the complex (colonies #1-13).

c. Transecting conducted by USU/BLM crew. Transecting was completed on the east side of the complex (colonies #14-26).

d. Entire complex was transected by USU/BLM crew and L. Renner (contracted by CDOW). USU/BLM crew transected colonies #1-13 (west side). Renner transected the east side using two different mappings (see [f] and [g] below). Totals calculated using the west side data and Renner's transects based on his new mapping in 2002.

e. Transecting based on BLM mapping by USU/BLM crew on colonies #1-13. This data was used in calculation of complex totals for 2002-2003.

f. Transecting based on BLM mapping by L. Renner on colonies #14-26.

g. Transecting based on mapping conducted in 2002 by L. Renner. These colonies overlap previously mapped colonies on the east side of the complex and have been designated #'s 27-39. This data used in calculation of complex totals for 2002-2003.

h. Totals for complex calculated using USU/BLM west side data and L. Renner's east side data based on the 2002 east side mapping. Numbers are comparable to the 2002 totals.

i. Estimated area of good habitat was determined by multiplying proportion of good habitat by colony size.

j. Good Habitat (equal to habitat capable of supporting black-footed ferret reproduction) is the number of transects with at least 25 active white-tailed prairie dog burrows per ha divided by the total number of transects.

Table 4. Summary statistics for surveys evaluating suitability of black-footed ferret habitat at Management Areas in Colorado from 1997-2003. Statistics have been calculated for the entire sample area and not just for good habitat.

Black-footed Ferret Management Area	Mean Population Estimate	Standard Deviation	Coefficient of Variation (%)	Monitoring Period (years)
Wolf Creek West[a]	12,066	6698.594	55	3
Wolf Creek East[b]	9,765	1362.04	14	3
Coyote Basin	3,931	1954.154	49.7	6

a. Transecting was completed on the west side of the complex (colonies #1-13).

b. Transecting was completed on the east side of the complex (colonies #4-26).

Table 5. White-tailed prairie dog population analysis determined from surveys evaluating suitability of habitat for black-footed ferrets at Coyote Basin Black-footed Ferret Management Area, Colorado.

Year	Size (ha)	% of Good Habitat [a]	White-tailed Prairie Dog /ha Good Habitat [b]	Population Estimate for Good Habitat	White-tailed Prairie Dog /ha for Entire Area sampled	Population Estimate for Entire Area Sampled
1997	708	52.2	6.84	2,527	4.42	3,132
1998	-	-	-	-	-	-
1999	529	85.9	11.57	5,260	10.41	5,509
2000	529	100	12.60	6,666	12.60	6,666
2001	529	85.9	7.38	3,355	6.70	3,545
2002	529	94.4	7.22	3,604	6.95	3,677
2003	529	16.6	6.39	571	1.99	1,055

a. Estimated area of good habitat was determined by multiplying proportion of good habitat by colony size.

b. Good Habitat (equal to habitat capable of supporting black-footed ferret reproduction) is the number of transects with at least 25 active white-tailed prairie dog burrows per ha divided by the total number of transects.

Table 6. The amount of hectares impacted by agriculture within the gross range of the white-tailed prairie dog.

State	Colorado	Montana	Utah	Wyoming
Orchards/ Vineyards	1,284	0	78	0
Pasture/Hay	183,231	4,980	80,230	275,395
Row Crops	74,330	3,605	9,270	70,971
Small Grains	182	2,458	3,605	21,767
Fallow	235	1,756	2	15,153
Total	**259,263**	**12,799**	**93,189**	**383,287**
Percent of Gross Range	**6%**	**7%**	**3%**	**3%**

[a.] Gross range is the outer boundary identifying white-tailed prairie dog distribution and does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

Table 7. Urban areas located within the gross range of the white-tailed prairie dog.

Urban Area[a]	**Urban (ha) in Gross Range**[b]
Battlement Mesa, CO	601
Cody, WY	1,783
Craig, CO	1,287
Delta, CO	1,309
Eagle, CO	230
Evanston, WY	2,436
Fruita, CO	1,038
Grand Junction, CO	14,547
Green River, WY	1,002
Gypsum, CO	517
Kemmerer, WY	323
Lander, WY	613
Laramie, WY	3,644
Montrose, CO	2,767
Powell, WY	1,039
Price, UT	1,817
Rawlins, WY	1,199
Riverton, WY	2,074
Rock Springs, WY	3,114
Roosevelt, UT	572
Steamboat Springs, CO	798
Thermopolis, WY	555
Vernal, UT	3,090
Worland, WY	613
Total	**46,968**
Percent	**0.2%**

a. Urban designations were derived from the 2000 Census data.

b. Gross range is the outer boundary identifying white-tailed prairie dog distribution and does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

Table 8. Landownership within the gross and predicted range of the white-tailed prairie dog in Colorado.

Landownership	% of Landownership in White-tailed Prairie Dog Gross Range[a] (ha)	% of Landownership in White-tailed Prairie Dog Predicted Range[b] (ha)
Private	42 (1,753,944)	37 (536,717)
BLM	45 (1,908,349)	56 (825,648)
USFS	6 (272,631)	0.5 (7,629)
NPS	2 (77,173)	0.9 (14,409)
USFWS	0.3 (272,631)	0.4 (6,594)
State	4 (169,749)	5 (79,024)
Other Federal	0.5 (19,776)	0.00 (367)

a. Gross range is the outer boundary identifying white-tailed prairie dog distribution and does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

b. The predicted range was developed from a GIS model to depict a more accurate, spatial range of the white-tailed prairie dog. This model does not imply that the area could be or is appropriate for white-tailed prairie dog occupation.

Table 9. White-tailed prairie dog colonies located in Montana during surveys in 1975-1977 and in 2003.

Colony Name	**Colony Size (ha) 1975-1977**	**Colony Size (ha) 1999-2003**
1	2-4	-
2	0.8	-
3 (Chance Bridge)	30-34	5.1
4	8	-
5 (Robertson Draw)	100	16.4
6	1	-
7	28-40	-
8	4-8	-
9	32	-
10	20-32	-
11	16-24	-
12	8-20	-
13	1	-
14	0.4-1	-
15	1-4	-
Duplex		9.1
S. Sage Creek		5.9
Warren		7.5
Inferno Creek		4.2
Total	**15 colonies = 280 ha**	**6 colonies = 48 ha**

Table 10. Landownership within the gross and predicted range of the white-tailed prairie dog in Montana.

Landownership	% of Landownership in the White-tailed Prairie Dog Gross Range[a] (ha)	% of Landownership in the White-tailed Prairie Dog Predicted Range[b] (ha)
Private	47 (84,496)	49 (54,760)
BLM	37 (67,846)	44 (48,824)
USFS	12 (21,329)	2 (2,314)
State	4 (7,804)	5 (5,719)
Other Federal	0.00 (87)	0.00 (29)

a. Gross range is the outer boundary identifying white-tailed prairie dog distribution and does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

b. The predicted range was developed from a GIS model to depict a more accurate, spatial range of the white-tailed prairie dog.

Table 11. White-tailed prairie dog population analysis determined from surveys evaluating suitability of habitat for black-footed ferrets at 4 Black-footed Ferret Management Areas in Utah.

Black-footed Ferret Management Area	Year	Size (ha)	% of Good Habitat[b]	White-tailed Prairie Dog/ha Good Habitat[c]	Population Estimate for Good Habitat	White-tailed Prairie Dog /ha Entire Area Sampled	Population Estimate for Entire Area Sampled
Coyote Basin	1997	4075 [a]	91.2	11.45	42,541	10.60	43,205
	1998	4539 [a]	91.4	9.30	38,605	8.72	39,565
	1999	4544	77.8	10.12	35,783	8.40	38,180
	2000	4527[a]	74.7	9.47	32,035	7.39	33,438
	2001	4544	74.8	10.33	35,108	8.24	37,424
	2002	4544	91.5	12.86	53,451	11.98	54,444
	2003	4544	30.4	6.73	9,300	3.09	14,031
Kennedy Wash	1998	1196	82.2	10.41	10,240	8.94	10,697
	1999	1196	52.6	8.13	5,118	5.36	6,411
	2000	1196	47.9	8.65	4,949	4.79	5,725
	2001	1196	30.7	7.73	2,840	3.07	3,670
	2002	1196	73.6	10.80	9,504	8.60	10,282
	2003	1196	33.0	5.76	2,272	2.77	3,313
Shiner Basin	1997	1774 [a]	95.7	8.76	14,877	8.49	15,065
	1998	4327 [a]	99.3	11.04	47,447	10.99	47,551
	1999	3057 [a]	10.3	7.03	2,221	1.76	5,383
	2000	4332 [a]	40.4	6.24	10,915	3.16	13,707
Snake John	2001	5020	89.9	10.71	48,319	9.83	49,346
	2002	5020	81.3	11.93	48,680	10.05	50,437
	2003	5020	61.1	9.06	27,803	6.20	31,118

a. Differences in ha surveyed from year-to-year are due to small colonies being either surveyed or not surveyed in a given year.

b. Estimated area of good habitat was determined by multiplying proportion of good habitat by colony size.

c. Good Habitat (equal to habitat capable of supporting black-footed ferret reproduction) is the number of transects with at least 25 active white-tailed prairie dog burrows per ha divided by the total number of transects.

Table 12. Summary statistics for surveys evaluating suitability of black-footed ferret habitat at 4 Management Areas in Utah from 1997-2003.

Black-footed Ferret Management Area	Mean Population Estimate	Standard Deviation	Coefficient of Variation (%)	Monitoring Period (years)
Coyote Basin	37,184	12185.871	33	7
Kennedy Wash	6,683	3177.7921	48	6
Shiner Basin	20,427	18582.633	91	4
Snake John	43,633	10852.6	25	3

Table 13. Comparison of mapped white-tailed prairie dog occupied habitat in Utah from 1985-2002.

Survey Area	Year	Mapped ha	No. of Colonies	% Annual Change in Mapped ha
Huntington	1994	2,352	31	-10.8
	2002	321	6	
Buckhorn	1985	2,684	11	2.3
	2002	3,739	3	
Woodside	1985	871	6	-4.7
	2002	169	1	
Crescent Junction	1985	4,089	33	-0.16
	2002	3,973	10	
Cisco	1985	16,729	122	-4.9
	2002	2,684	12	
Eightmile Flat	1985	2,673	3	0.7
	1999	2,936	24	
Twelvemile Flat	1985	363	3	8.7
	2002	901	24	
Sunshine Bench	1993	2,085	7	30.6
	2002	7,837	38	
Coyote Basin	1985	2,424	26	17.8
	1997/98	7,604	44	

Table 14. Landownership within the gross and predicted range of the white-tailed prairie dog in Utah.

Landownership	% of Landownership in White-tailed Prairie Dog Gross Range[a] (ha)	% of Landownership in White-tailed Prairie Dog Predicted Range[b] (ha)
Private	20 (636,908)	20 (343,413)
BLM	58 (1,857,259)	60 (1,022,606)
USFS	0.7 (2,222)	0.4 (6,733)
NPS	1 (36,347)	0.9 (15,123)
BIA	9 (281,593)	7 (111,949)
State	11 (353,846)	11 (188,908)
USFWS	0.1 (3,622)	0.1 (2,416)
Other Federal	0.2 (7,867)	0.09 (1,490)

a. Gross range is the outer boundary identifying white-tailed prairie dog distribution and does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

b. The predicted range is a more accurate, spatial depiction of the range of the white-tailed prairie dog. This model does not imply that the area could be or is appropriate for white-tailed prairie dog occupation.

Table 15. Annual drilling results from completion reports submitted by well operators as of 3/26/04 for total wells drilled by county in Utah within the gross range of the white-tailed prairie dog.

County	2003	2002	2001	2000	1999	1998	1997	1996	1995	19994	1993	1992	1991
Carbon	34	51	103	122	110	74	41	13	19	47	28	35	5
Daggett	0	0	0	0	0	0	0	0	0	1	0	0	1
Duchesne	89	44	74	63	10	123	160	151	57	50	43	31	37
Emery	14	53	44	55	16	3	23	12	18	8	0	6	2
Grand	6	4	6	4	1	6	4	2	1	8	7	2	13
Rich	0	0	6	2	0	0	0	0	0	0	0	0	0
Summit	0	0	1	0	2	3	5	5	5	7	3	1	1
Uintah	333	226	386	288	140	186	154	63	99	76	33	262	141

Table 16. White-tailed prairie dog complexes and estimated hectares in Wyoming.

Complex	Pre-1995 Estimated Ha
Big Piney	5,581
Bolton Ranch	2,718
Baxter Basin	2,827
Carter	2,236
Cumberland	9,159
Dad	2,746
Fifteen Mile	4,060
Flaming Gorge	2,436
Kinney Rim	7,215
Manderson	4,553
Meeteetse	4,371
Moxa	13,219
Pathfinder	5,061
Saratoga	12,194
Seminoe	698
Shamrock Hills	8,005
Shirley Basin / Medicine Bow	56,453
Sweetwater	5,752

Table 17. White-tailed prairie dog population analysis determined from surveys evaluating suitability of habitat for black-footed ferrets at Shirley Basin/Medicine Bow Black-footed Management Area, Wyoming.

Year	Total Uncorrected Ha	Total Corrected Ha[a]	Percent of Complex Transected[b]	No. of Colonies Transected	Prairie Dogs/Ha	Prairie Dog Estimate
1991	19,274	17,025	31%	26	15.30	30,389
1992	16,301	14,373	26%	24	15.30	29,828
1993	13,656	11,609	22%	14	14.53	14,551
1994	3,444	3,363	6%	4	14.99	5,916
1995	12,306	10,821	20%	17	13.96	7,564
1996	11,538	10,293	19%	27	15.43	19,876
1997	9,835	8,240	16%	25	14.59	10,343
1998	9,928	8,956	16%	26	14.26	6,547
1999	11,116	8,681	18%	26	13.26	7,161
2000	10,196	8,402	16%	24	14.42	6,669
2001[c]	11,491	10,165	19%	20	17.21	34,698

a. Corrected area was calculated by proportionally discounting area attributed to transects with < 8 total burrows in the uncorrected area.

b. Percent of complex transected per survey year was calculated taking the Total Uncorrected Ha and dividing by 62,114 ha (1991 complex estimate Parrish and Luce 1991), therefore, the percentage does not account for remapping efforts.

c. A total of 6,444 (56%) uncorrected hectares were not surveyed between 1991 and 2000.

Table 18. White-tailed prairie dog population analysis determined from surveys evaluating suitability of habitat for black-footed ferrets at Meeteetse Black-footed Ferret Management Area, Wyoming.

Year	Hectares	No. of Colonies Transected	Prairie Dogs/Ha	Prairie Dog Estimate
1988	4,861	15	9.72	25,494
1989	4,932	16	7.34	17,692
1990	4,999	16	7.88	14,278
1991	5,107	16	7.83	10,390
1992	5,107	16	5.76	2,169
1993	5,107	16	6.70	1,299
1997	5,107	16	7.51	7,095

Table 19. Landownership within the gross and predicted range of the white-tailed prairie dog in Wyoming.

Landownership	% of Landownership in White-tailed Prairie Dog Gross Range[a] (ha)	% of Landownership in White-tailed Prairie Dog Predicted Range[b] (ha)
Private	34 (4,362,479)	33 (3,244,833)
BLM	49 (6,142,433)	54 (5,301,009)
USFS	5 (620,696)	0.8 (82,552)
NPS	0.06 (7,990)	0.03 (3,457)
BIA	3 (411,381)	3 (322,574)
State	6 (724,714)	6 (575,991)
USFWS	0.09 (12,045)	0.1 (10,696)
Other Federal	3 (346,295)	3 (249,939)

a. Gross range is the outer boundary identifying white-tailed prairie dog distribution and does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

b. The predicted range distribution model was produced as a more accurate, spatial depiction of the range of the white-tailed prairie dog. This model does not imply that the area could be or is appropriate for white-tailed prairie dog occupation.

Table 20. Hectares poisoned in cooperative and Federal prairie dog and ground squirrel eradication campaigns (adapted from Bell 1921).

State	1916	1917	1918	1919	1920
Colorado	16,553	16.853	64,392	321,912	311,409
Montana	29,776	33,491	1,489,973	1,837,905	2,803,334
Utah	-	-	1,721	128,678	238,674
Wyoming	137,918	179,139	290,246	163,753	54,715

Figure 1. White-tailed prairie dog gross range, predicted range and location of identified white-tailed prairie dog colonies from 1985-2003.

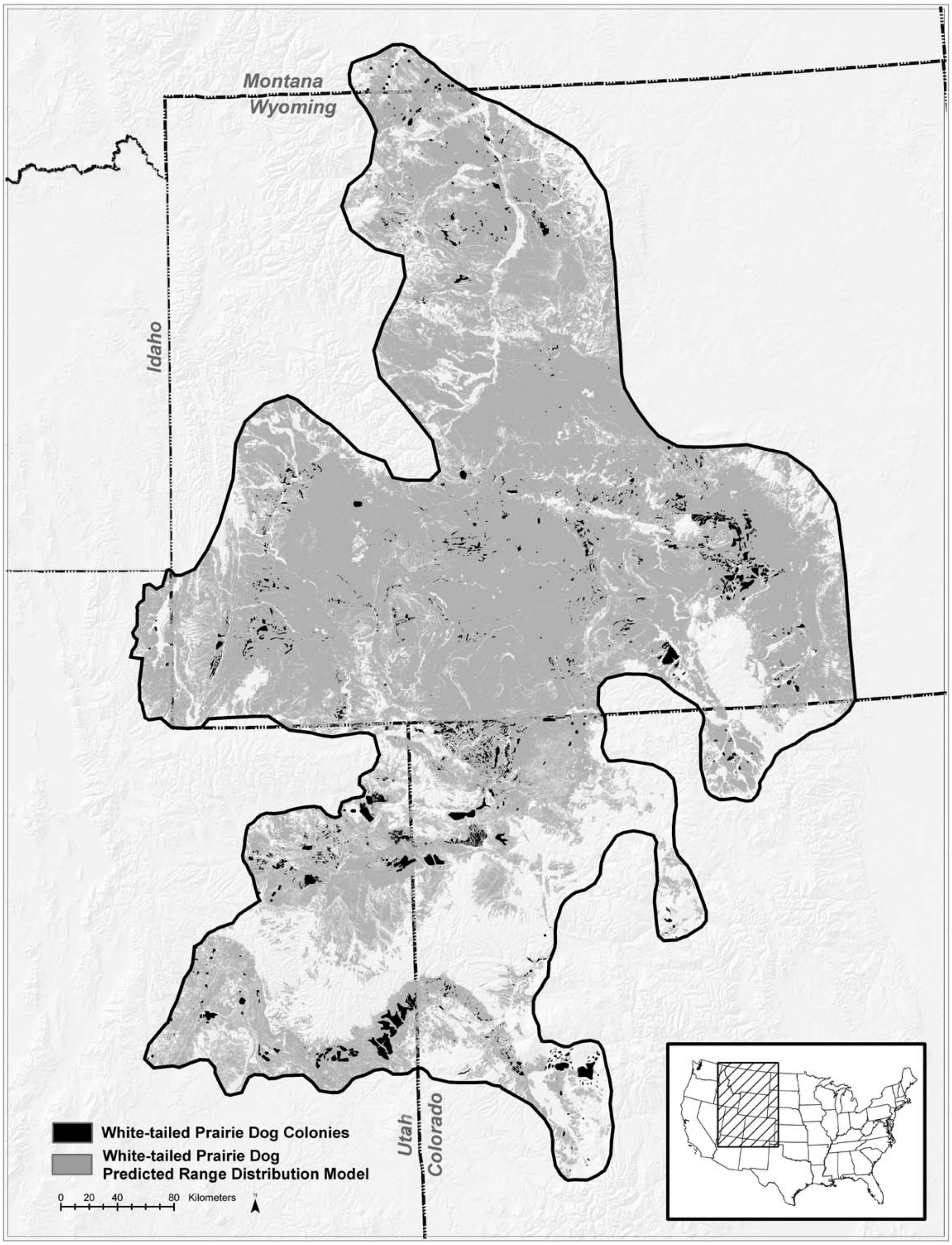


Figure 2. Location of known white-tailed prairie dog complexes/sub-complexes within the gross range of the species identified from 1985-2003.

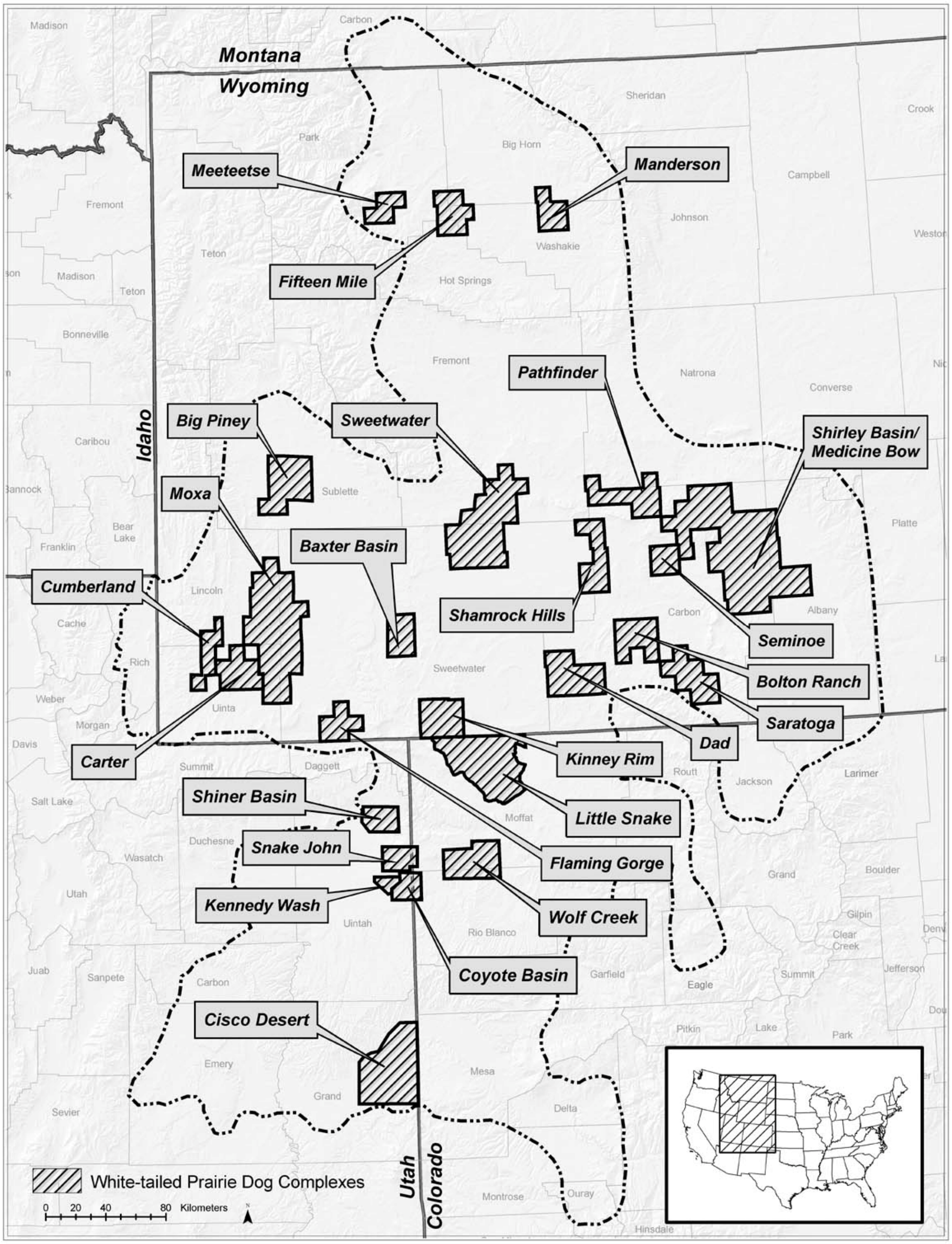


Figure 3. White-tailed prairie dog population analysis determined from surveys evaluating suitability of habitat for black-footed ferrets at Coyote Basin and Wolf Creek Black-footed Ferret Management Areas in Colorado and average population estimates across all surveys.

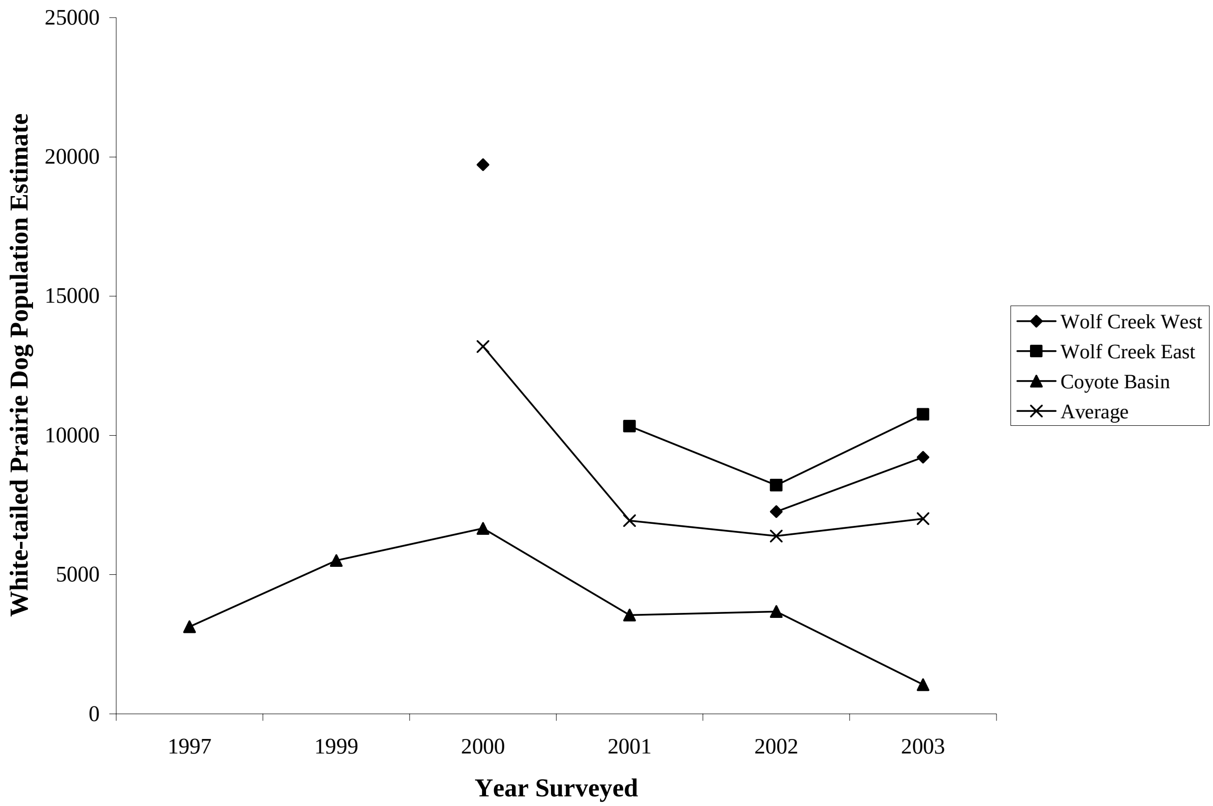


Figure 4. Change in mapped white-tailed prairie dog occupied habitat in the Little Snake Black-footed Ferret Management Area in Colorado between 1989 and 1999.

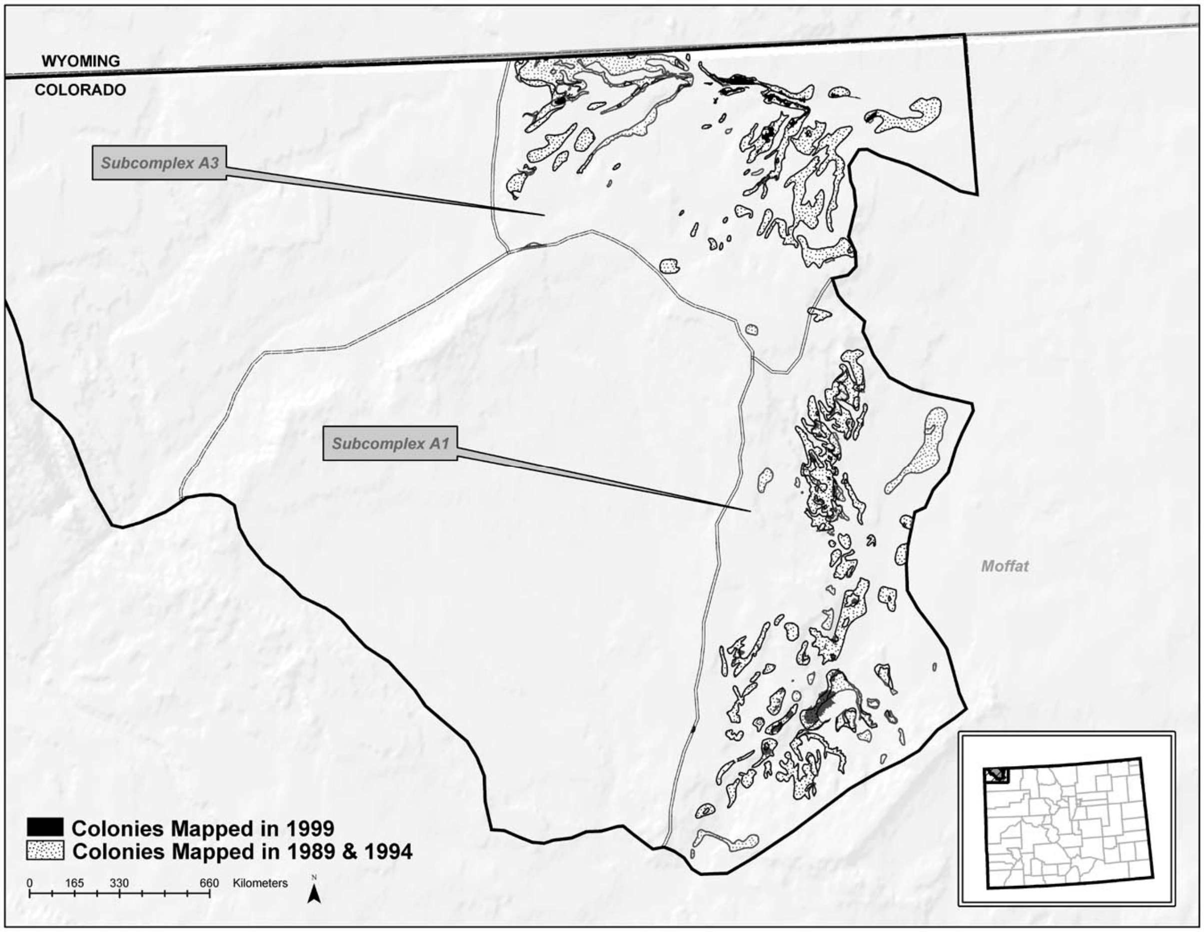


Figure 5. White-tailed prairie dog gross range, predicted range and location of identified colonies in Colorado from 1989-2003.

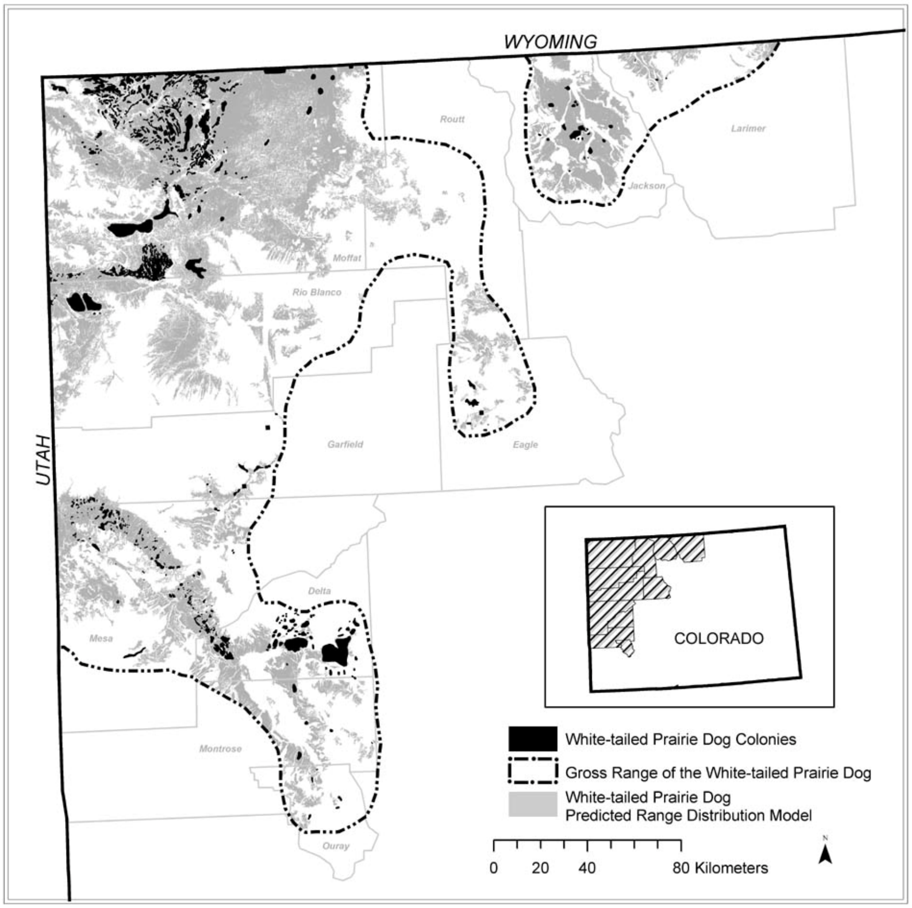


Figure 6. White-tailed prairie dog gross range, predicted range and location of identified colonies in Montana from 1975-2003.

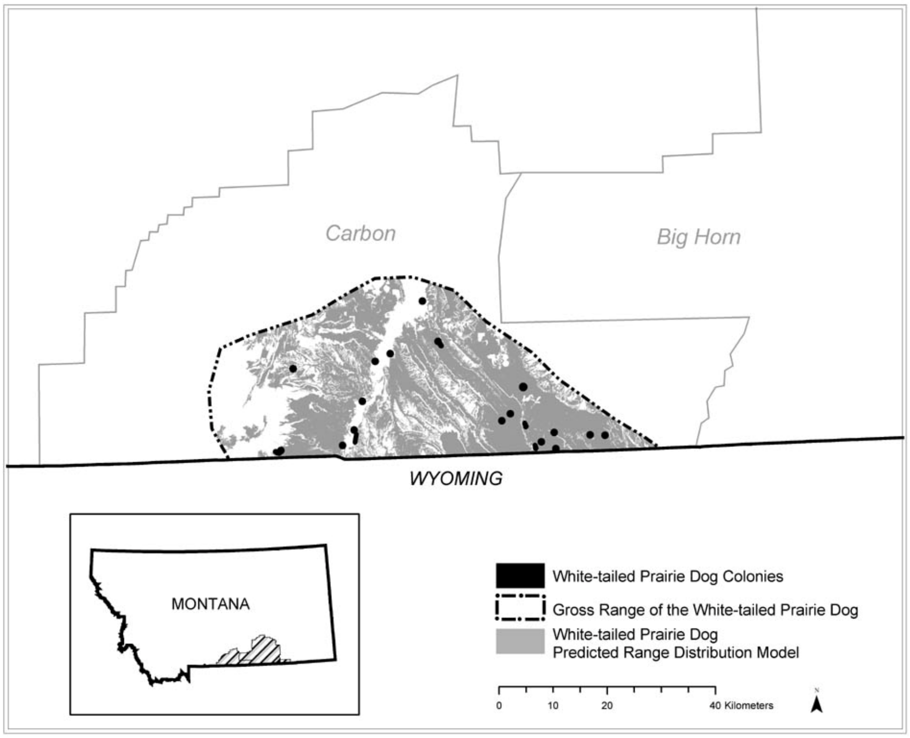


Figure 7. White-tailed prairie dog population analysis determined from surveys evaluating suitability of habitat for black-footed ferrets at 4 Black-footed Ferret Management Areas in Utah and average population estimates across all surveys.

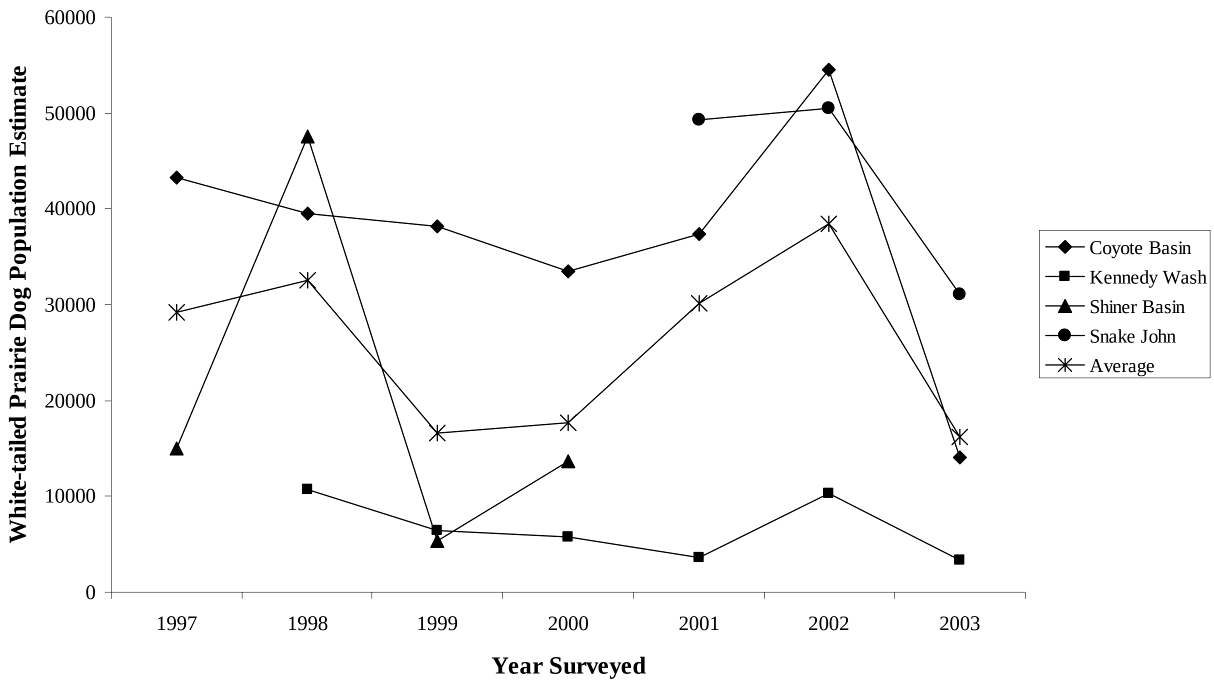


Figure 8. Changes in white-tailed prairie dog occupied habitat at selected areas mapped in Utah from 1985-2002.

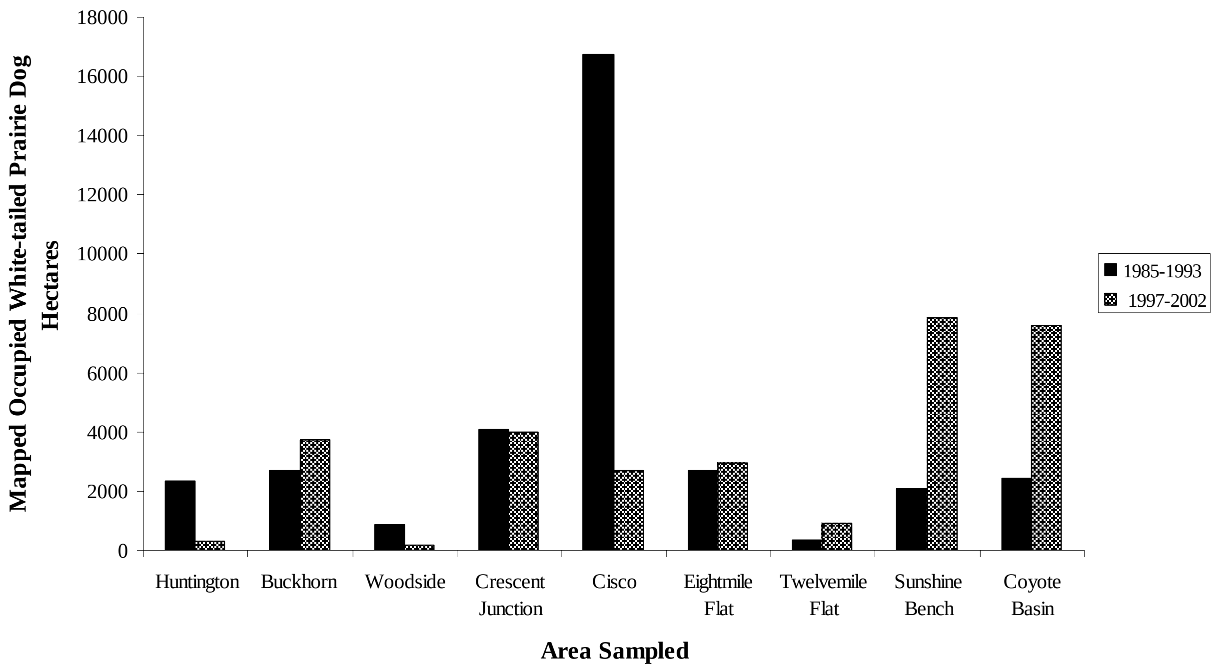


Figure 9. Study areas in Utah where comparisons were made to document changes in white-tailed prairie dog occupied habitat from 1985-2002.

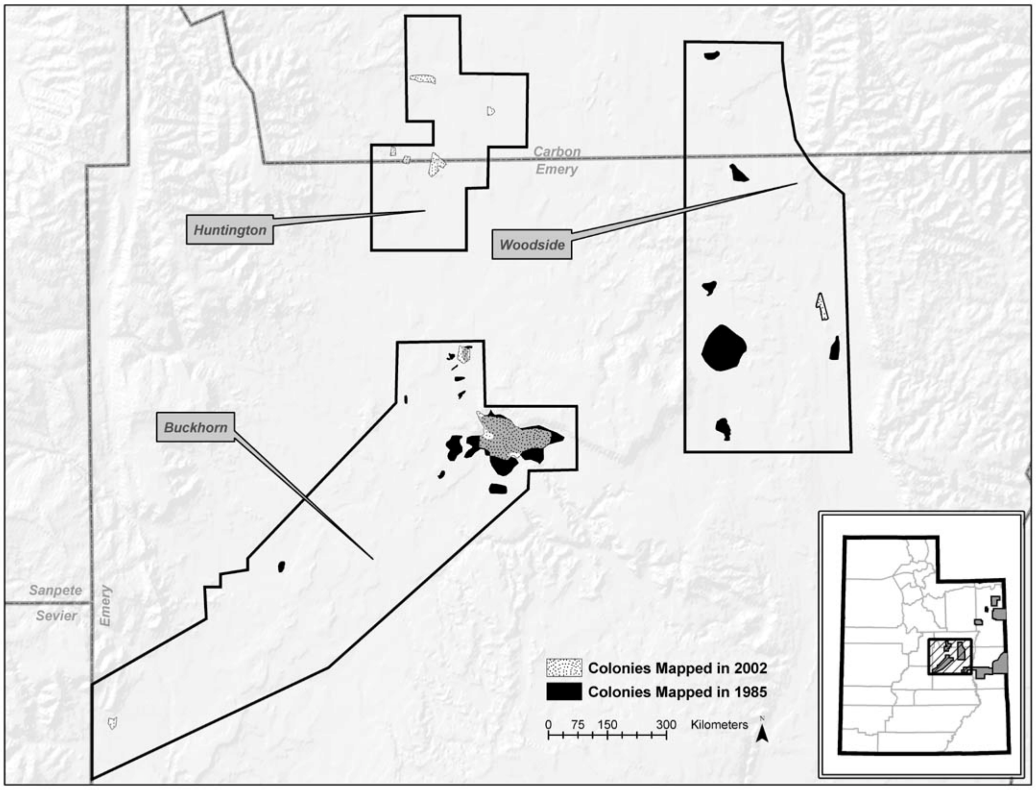


Figure 10. Study areas in Utah where comparisons were made to document changes in white-tailed prairie dog occupied habitat from 1985-2002.

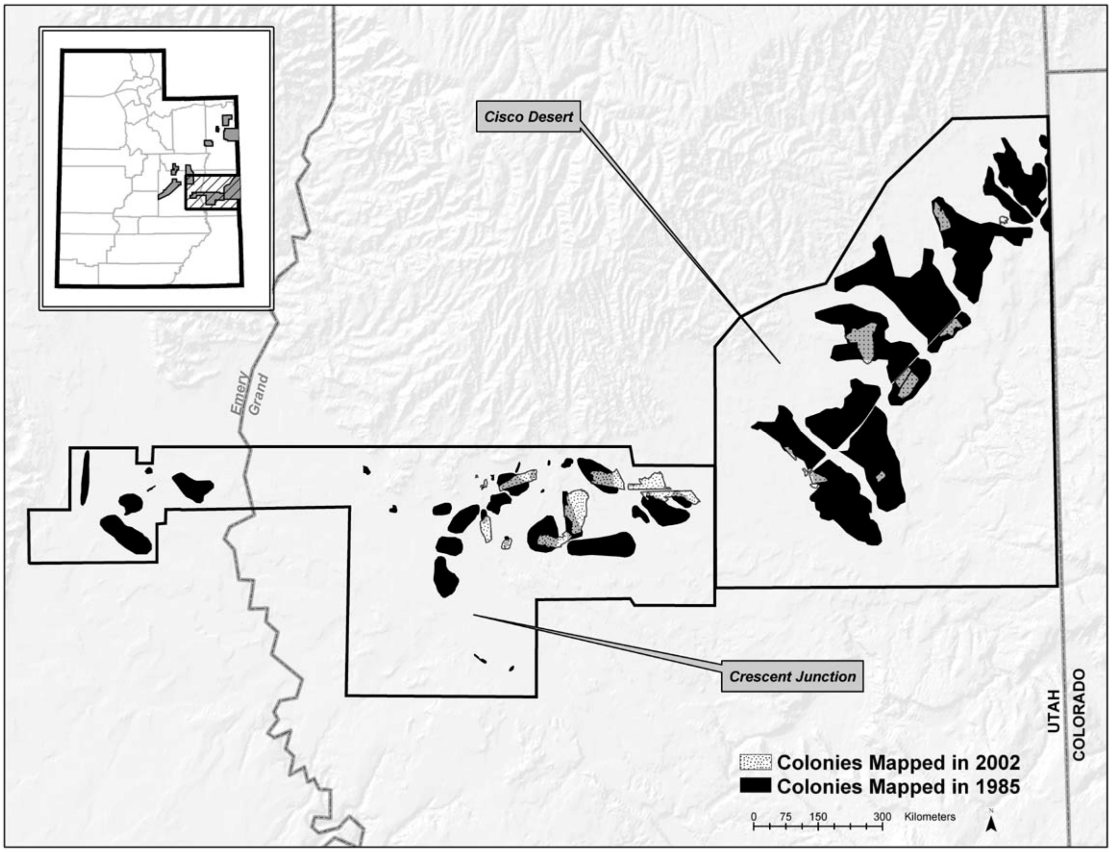


Figure 11. Study areas in Utah where comparisons were made to document changes in white-tailed prairie dog occupied habitat from 1985-2002.

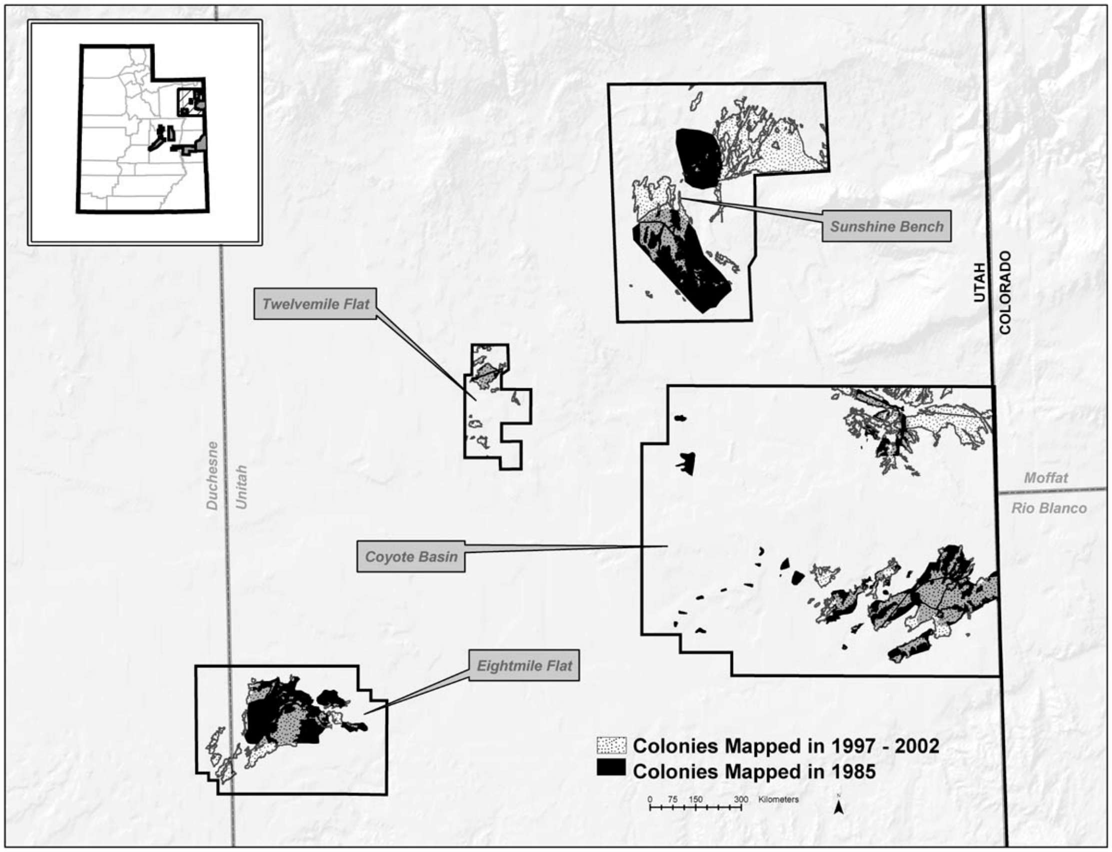


Figure 12. White-tailed prairie dog gross range, predicted range and location of identified colonies in Utah from 1985-2003.

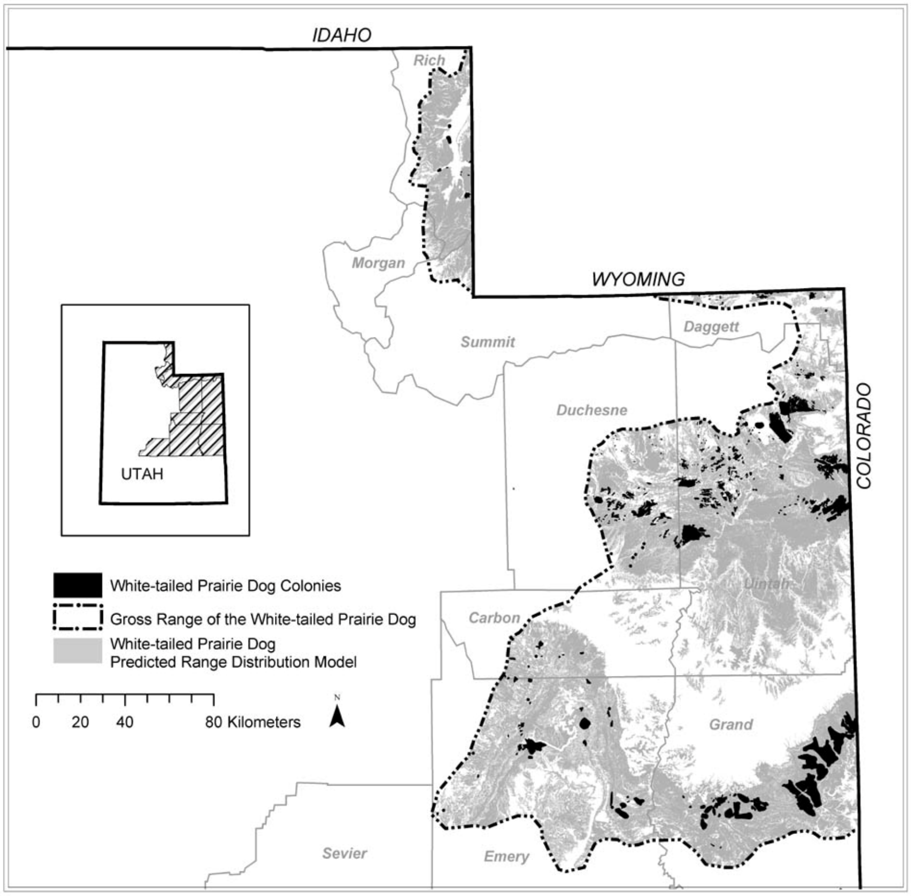


Figure 13. Distribution of townships with at least 405 ha (1,000 ac) of occupied white-tailed prairie dog habitat prior to 1995 in Wyoming.

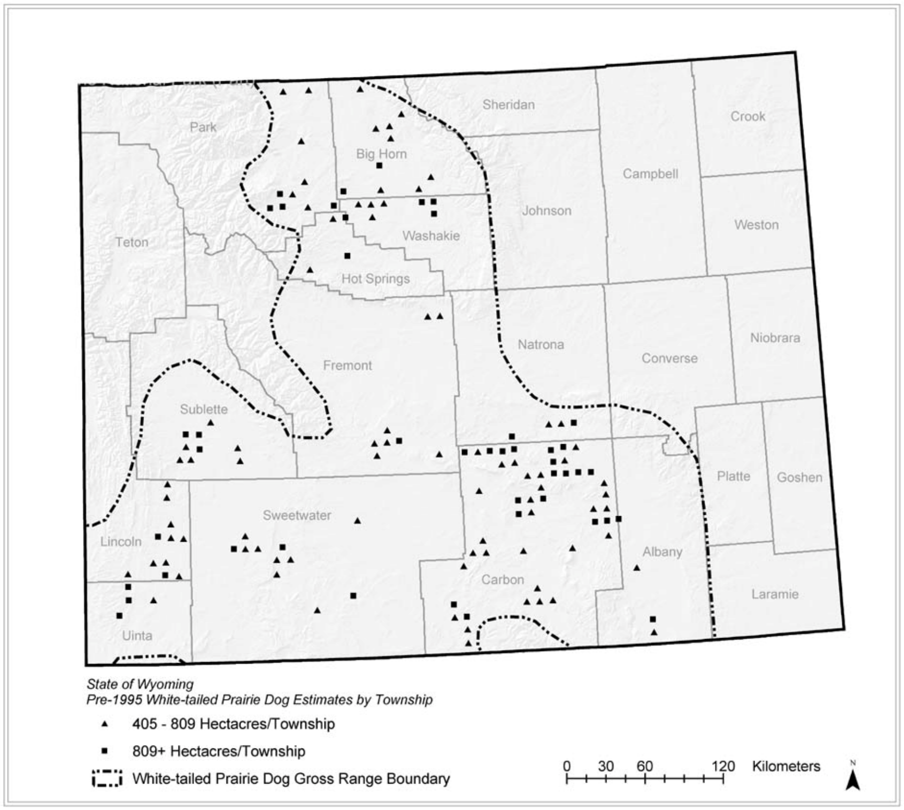


Figure 14. Shirley Basin/Medicine Bow Black-footed Ferret Management Area, Wyoming.

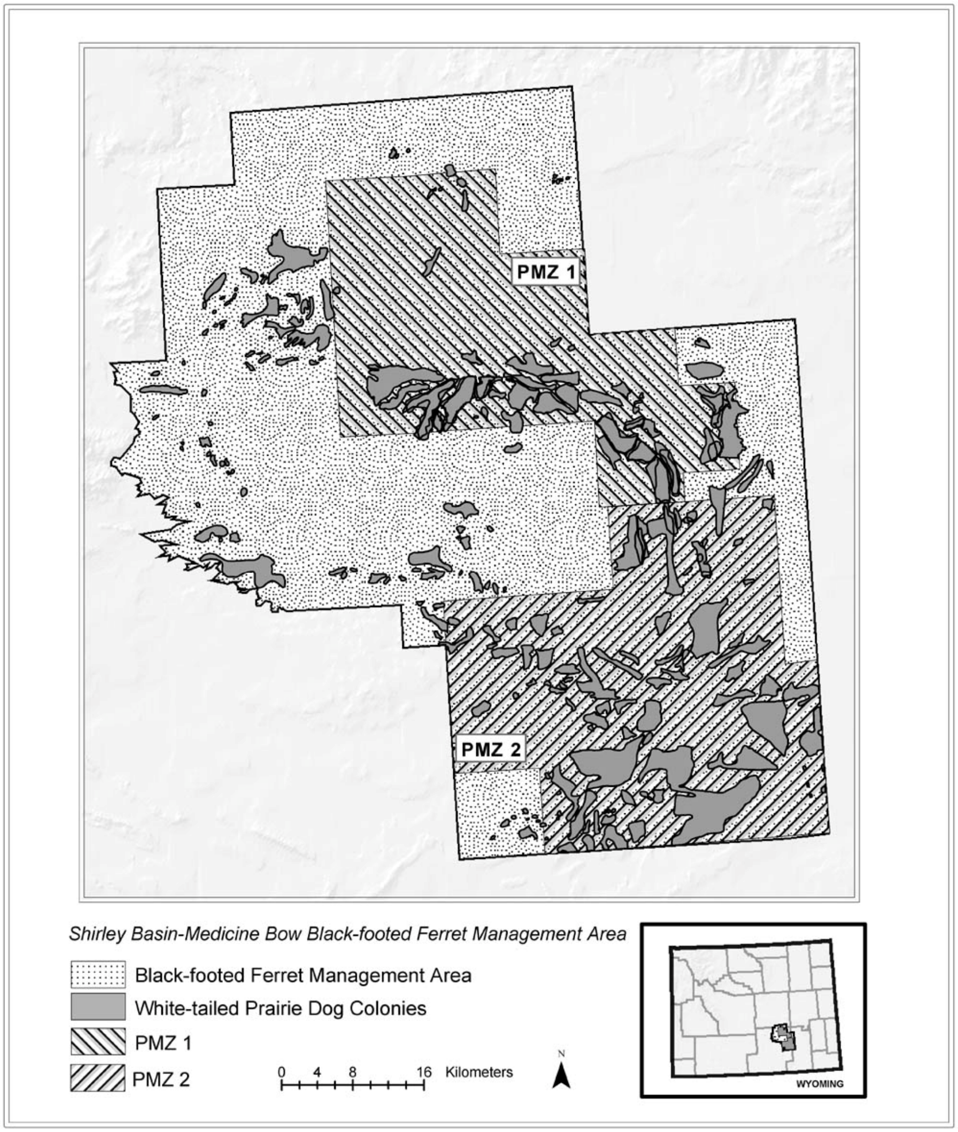


Figure 15. Comparison of white-tailed prairie dog estimate for 4 colonies monitored at the Shirley Basin/Medicine Bow Black-footed Ferret Management Area, Wyoming, from 1991 to 2000.

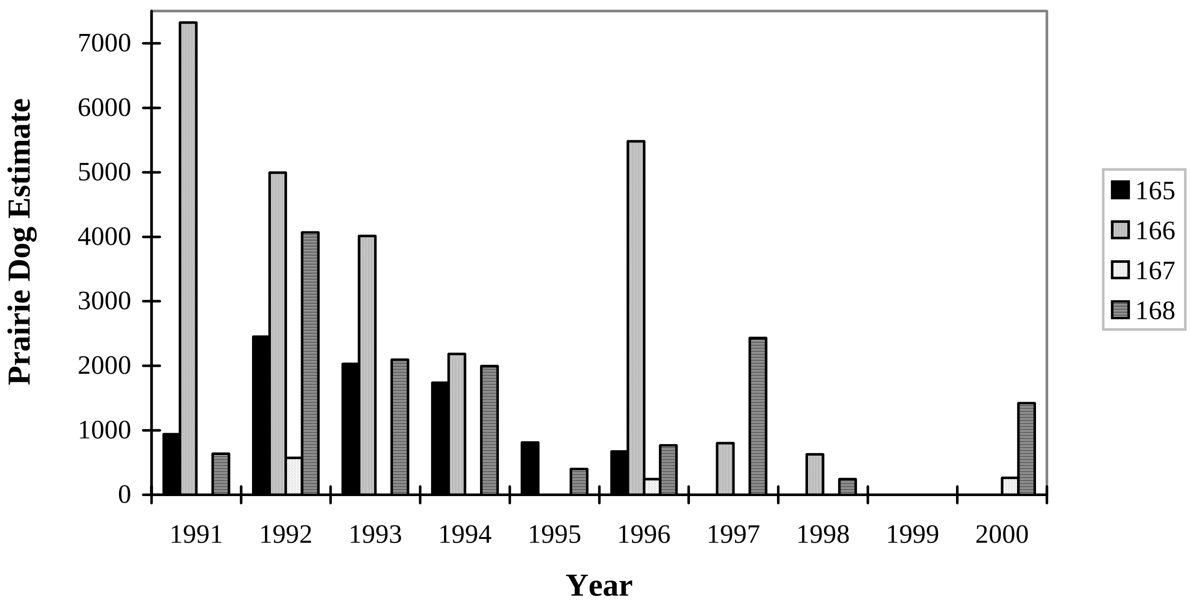


Figure 16. Comparison of 1991 and 2001 mapping efforts within the Shirley Basin/Medicine Bow Black-footed Ferret Management Area, Wyoming.

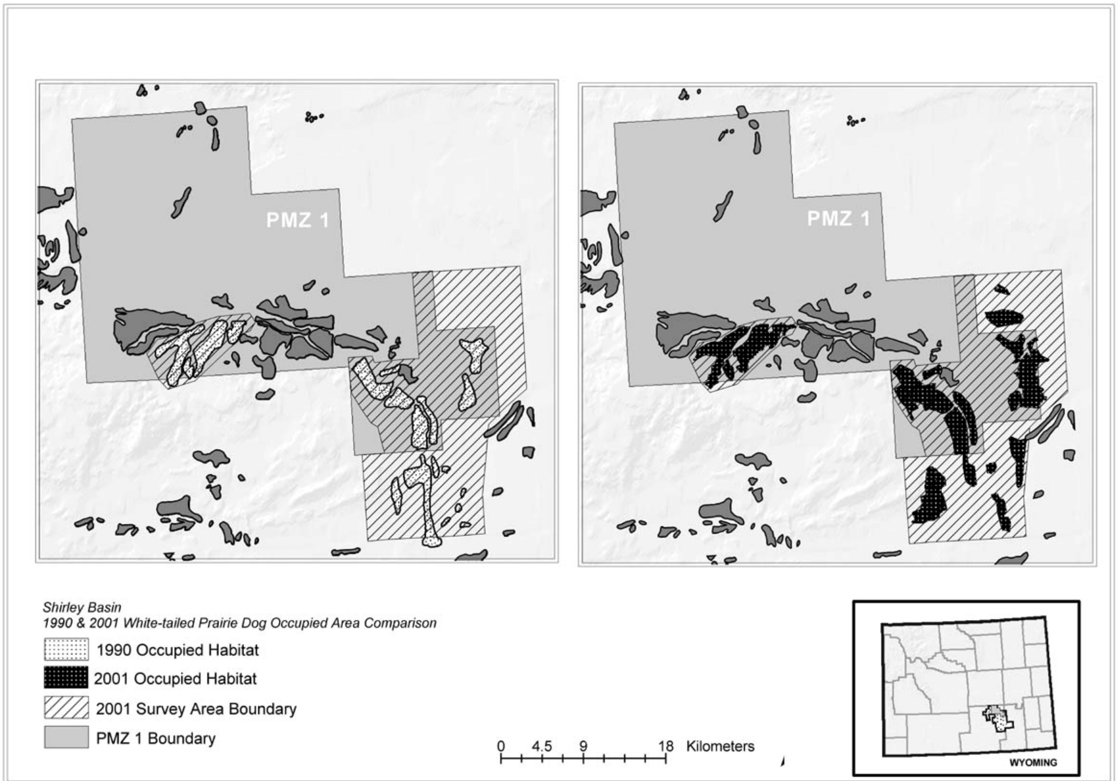


Figure 17. Comparison of 1991 and 2004 mapping efforts within the Shirley Basin/Medicine Bow Black-footed Ferret Management Area, Wyoming.

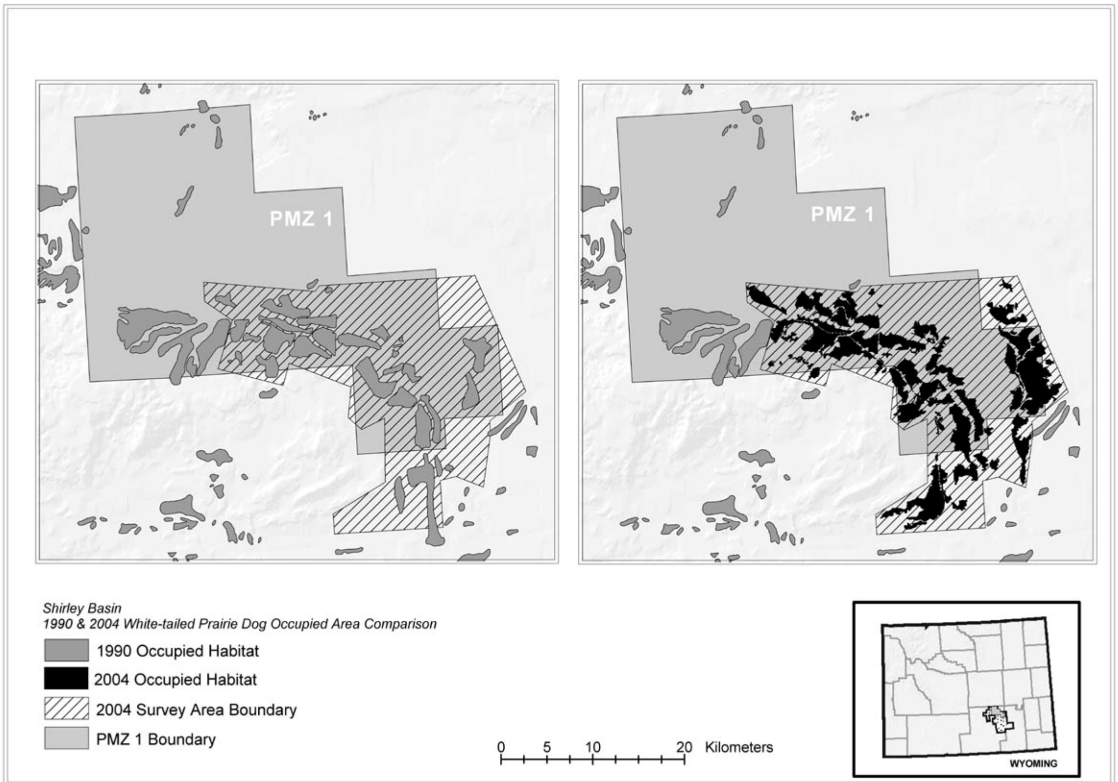


Figure 18. Comparison of white-tailed prairie dog mapping efforts within the Sweetwater Complex, Wyoming from pre-1995 to 2002.

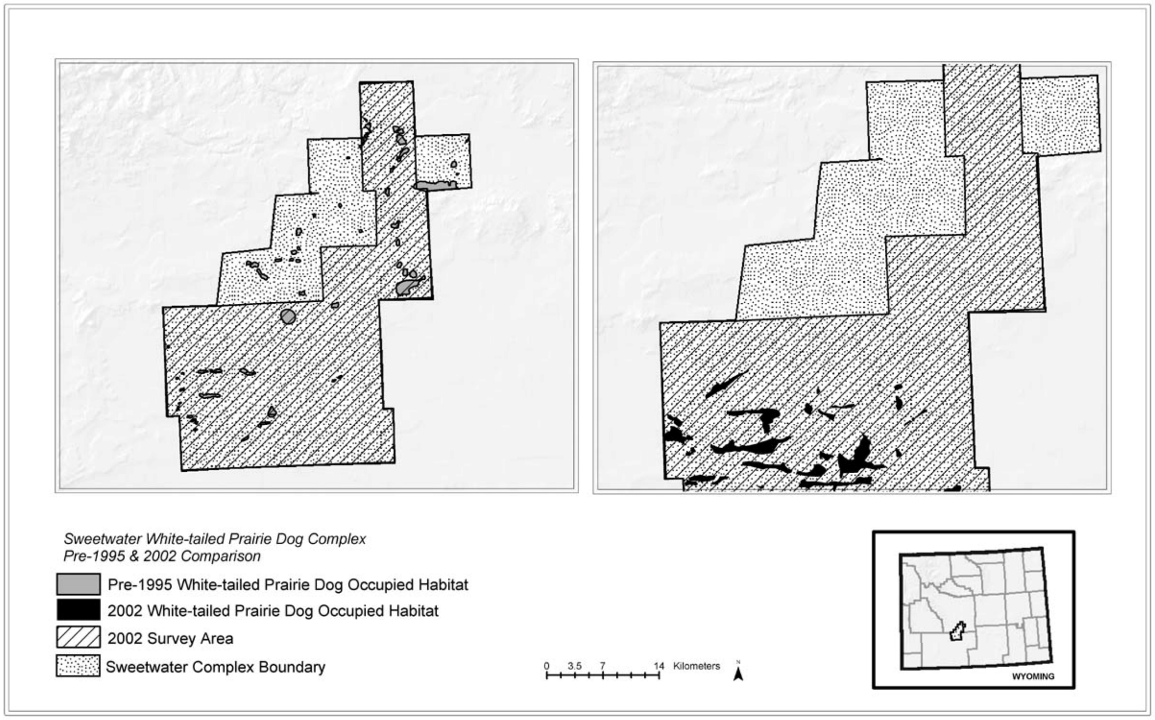
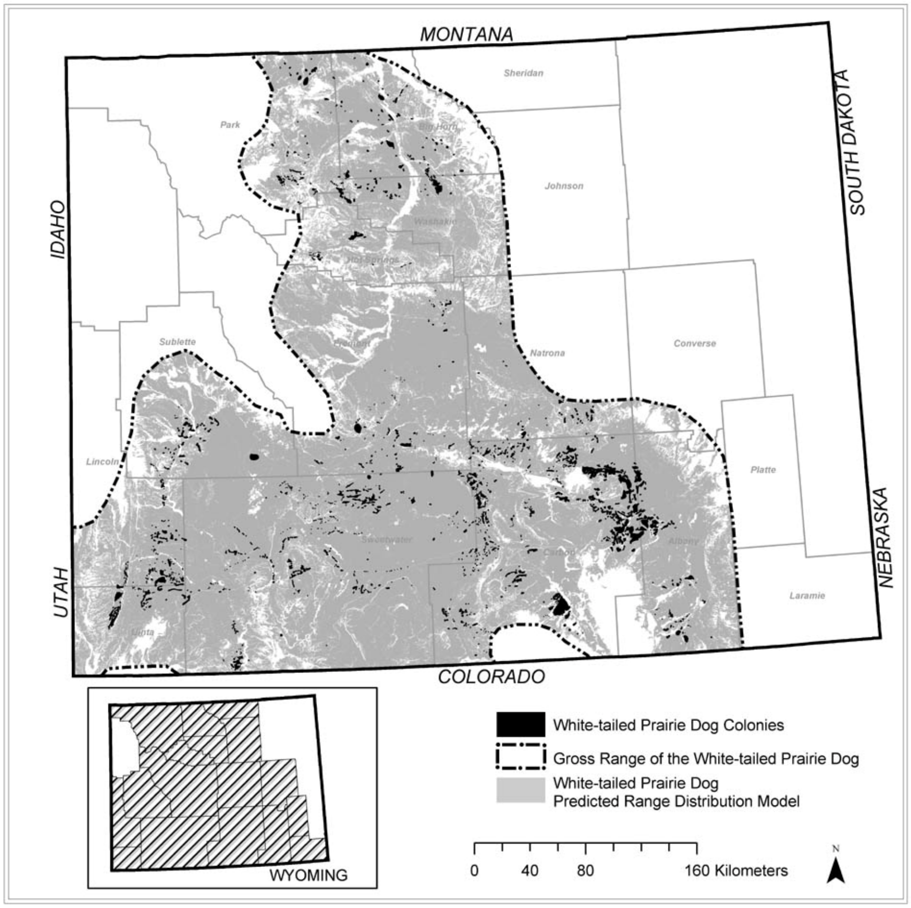


Figure 19. White-tailed prairie dog gross range, predicted range and location of identified colonies in Wyoming from surveys before 1995.



Appendix I.

GLOSSARY OF TERMS

Associated Species- Species that benefit from white-tailed prairie dogs, either directly or indirectly, but are not dependent on them for survival.

Candidate Species- Plants and animals that the USFWS, through review of available information, has determined should be proposed for addition to the federal threatened or endangered species list.

Colony- A concentration of white-tailed prairie dogs with a minimum of 20 burrow openings per ha on 5 ha parcels (Biggins et al. 1993).

Complex- A group of white-tailed prairie dog colonies distributed so that individual black-footed ferrets can migrate between them commonly and frequently. Colonies within a complex are not separated from the nearest adjacent colony by more than 7 km and no impassable barriers exist between colonies that would hinder black-footed ferret movement.

Conservation- (a) From section 3(3) of the federal Endangered Species Act: "… the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided under {the} Act are no longer necessary;" (b) The retention of natural balance, diversity, and evolutionary change in the environment.

Control Measures- Actions taken to reduce the numbers and/or occupied habitat of white-tailed prairie dogs, primarily through lethal means.

Corrected ha - The occupied habitat of the white-tailed prairie dog colony where there is $\geq$ 8 burrows per survey transect.

Coterie- A territorial, harem-polygynous family group of prairie dogs, typically consisting of a breeding adult male, two or three adult females and several yearlings or juveniles (Hoogland 1995).

Dispersal- The outward spreading of organisms from their point of origin or release; the outward extensions of a species' range.

Ecosystem- Dynamic and interrelating complex of plant and animal communities and their associated nonliving (e.g., physical and chemical) environment.

Endangered Species- A species which is in danger of extinction throughout all or a significant portion of its range [ESA§3(8)].

Extirpated Species- A species no longer occurring in a region that was once part of its range.

Good Black-footed Ferret Habitat – This is equal to habitat capable of supporting black-footed ferret reproduction. It is determined from transect data and is the number of transects with at least 25 active white-tailed prairie dog burrows per ha divided by the total number of transects.

Gross Range- The outer boundary identifying white-tailed prairie dog distribution. This does not imply that all lands contained within the boundary are occupied or have the potential to be occupied by white-tailed prairie dogs.

Habitat- The local environment occupied by an organism and those components required to complete its life cycles, including air, food, cover, water, and spatial requirements.

Historic Range- Those geographic areas the species was known or believed to occupy in the past.

Incentive- Assistance, financial payment or other action which encourages individuals or organizations to participate in an effort or activity, or which offsets any sacrifices an individual or organization may make to participate in an effort or activity.

Listing - The formal process through which the USFWS adds species to the Federal List of Threatened and Endangered Wildlife and Plants.

Mapping – Estimates amount of area occupied by white-tailed prairie dogs by locating colonies and plotting a line around the outermost burrows within a colony. Most mapping includes both active and inactive burrows.

Petition (for Listing)- A formal request, with the support of adequate biological data, suggesting that a species be listed, reclassified, or delisted, or that critical habitat be revised for a listed species: section 4(b)(3)(A) of ESA.

Predicted Range - The predicted range was determined using a GIS model to produce a more accurate, spatial depiction of the range of the white-tailed prairie dog. This model is not meant to imply that the entire area could be or is appropriate for white-tailed prairie dog occupation.

Population - All individuals of one species occupying a defined area and usually isolated to some degree from other similar groups.

Occupied Habitat- Land (hectares) that has white-tailed prairie dogs in residence.

Obligate Species- Species that, either directly or indirectly, are dependent on black-tailed prairie dogs for survival.

Re-establish- To restore (reintroduce) a species to an area that it historically inhabited.

Species- A group of individuals that can actually or potentially breed with each other and produce fertile offspring under natural conditions, but cannot breed with other such groups.

Species of Concern- An informal term, conferring no legal status, given to species that are of management concern due to declining numbers and/or loss of habitat. State wildlife agencies maintain a list of species of special concern that identifies species whose occurrence may be in jeopardy.

State Trust lands- Lands entrusted to the state by the Federal government and managed by the State Land Department for revenue for Trust beneficiaries (e.g., public schools, colleges, hospitals, charitable institutions). These are not public lands except in Arizona, Montana and Wyoming (access permit required) and South Dakota (no access permit required).

Sub-complex - An aggregation of colonies not separated from the nearest adjacent group by more than 7 km, but due to various factors (e.g. state boundaries, land ownership) the whole complex is not surveyed and management occurs on only a portion of the entire complex.

Subspecies- A group of interbreeding natural populations differing morphologically and genetically, and often isolated geographically from other such groups within a biological species but interbreeding successfully with them where their ranges overlap.

Sylvatic Plague- An acute, infectious disease caused by the bacteria *Yersinia pestis* that primarily affects rodents, rabbits, and associated carnivore and scavenger species. The agent is transmitted through the bite of an infected flea or through direct contact with an infected carcass. It is known as bubonic plague in humans and sylvatic plague in the wild.

Threatened Species- A species that is likely to become endangered throughout all or a significant portion of its range.

Tularemia- Is a pathogen native to North America that can cause disease-related declines in white-tailed prairie dog populations (Davis 1935).

Uncorrected Hectares - Includes the total area of a white-tailed prairie dog colony regardless of activity levels.

Appendix II.

Summary of Biggins et al. (1989, 1993) methodology used in Colorado, Utah and Wyoming.

The Biggins et al. (1989, 1993) methodology is based on estimated prairie dog biomass as food for black-footed ferrets to maintain themselves within given stages of life. Reproductive stages (e.g., gestation, lactation, post-weaning, post-dispersal replenishment, and young development) represent 70% of the estimate and were determined to be the most restrictive, highest demand of prairie dog biomass for black-footed ferrets. The methodology then works backwards from the estimated prairie dog biomass to derive a prairie dog estimate that can theoretically support reproductive states of black-footed ferrets.

Biggins Methodology used to evaluate black-footed ferret habitat suitability:

1. Use strip transects 1,000 m x 3 m within mapped prairie dog colonies.
2. Run strip transects along the width (long axis) of a colony.
3. Provide a 60 m spacing from the end of one transect to the start of another transect as well.
4. as a 60 m side-to-side spacing between transects.
5. Number of transects varies year-to-year depending on colony size and distribution of animals
6. Maintain a straight line while transecting and reverse course and continue transects after reaching colony boundary. Results in U-shaped transects.
7. Select random starting point for transecting each year.

Alterations in methodology made by Colorado and Utah:

1. Strip transects are 3 m wide but may not equal 1,000 m. Transects < 1,000 m are proportionately corrected for in the analysis.
2. Many transects are conducted along the short axis of the town.
3. 250-m side-to-side spacing between transects. Utah (Coyote Basin) has two groups of transects run at much narrower spacing, for higher sampling intensity. The majority are at the lower sampling intensity, and only these are used in calculations.
4. Number of transects is permanently fixed and repeated every sample year regardless of change in animal distribution.
5. Fixed annual starting point, repeated every sample year.

Alterations in methodology made by Wyoming:

1 200 m side-to-side spacing between transects.

The Wyoming Game and Fish Department discussed changes in side-to-side spacing with D. Biggins, and he agreed that a smaller sample could be taken by shifting distance between parallel transects from 60 m to 200 m without adversely affecting the output (B. Luce, Interstate Coordinator Prairie Dog Conservation Team, pers. comm.). The subsequent change to the methodology in 1990 has since served as the basis for all transecting conducted by the WGFD in Wyoming.

Appendix III.

Letter from Wyoming BLM to working group with regard to oil and gas development in the white-tailed prairie dog range.

"The BLM in Wyoming has no consistent, statewide policy for the management of white-tailed prairie dogs on Public Lands at this time." That's not to say that we are not doing anything for W-T Prairie Dogs, however. We have eight resource areas in Wyoming within the range of the white-tailed prairie dog (Worland, Cody, Rawlins, Rock Springs, Lander, Casper, Kemmerer, and Pinedale), and six of these resource areas are exclusively white-tailed prairie dogs (excluding Rawlins and Casper). The Cody Resource Area contains a couple of small, isolated, black-tailed prairie dog colonies of unknown origin. All of these resource areas are conducting some form of prairie dog management. The white-tailed prairie dog is declared a BLM sensitive species in Wyoming. Black-footed ferrets have been reintroduced into white-tailed prairie dog colonies in Shirley Basin as a "non-essential, experimental population", and seem to be thriving.

We have old inventories for prairie dogs of various extents and quality in each resource area, some of which date back decades. Each field office has numerous "small scale" inventories of dog towns that were conducted as part of activity clearances, including clearances for oil and gas (O&G) applications for permit to drill (APDs) and associated road, pipeline, and powerline Rights-of-Way (ROWs). While these clearances were conducted using the 1989 U.S. Fish and Wildlife Service (FWS) procedures for black-footed ferret (BFF) clearances, they yielded a lot of de facto prairie dog information, particularly temporal data on the geographic extent and activity of prairie dog colonies. In some instances, intensive prairie dog colony mapping efforts were the direct result of terms and conditions, and conservation measures, coming from ESA Sec. 7 consultations with the FWS (e.g., Continental Divide / Wamsutter II O&G EIS, etc.) conducted for other species. In other cases, the field office funded, or cost shared on the funding, of up-dated, baseline, prairie dog town inventories (e.g., Pinedale and Kemmerer PDT inventories). The new (i.e., February, 2004) FWS policy on "block clearances" for BFFs, while good in some respects, now makes many routine clearances unnecessary, thereby eliminating some PD town inventories that might otherwise occur.

In regard to planning – there are several BLM land use planning efforts (Resource Management Plan [RMP] revisions) underway at this time in W-T PD range in Wyoming (Rawlins, Pinedale, Casper, Kemmerer, and Lander). These RMP revisions are primarily driven by the most recent emphasis on oil and gas development activity. Each of these land use planning efforts are currently, or will be, addressing W-T PDs in the plan revisions. BLM has also had nominations submitted by several environmental groups for the designation of prairie dog "areas of critical environmental concern" (ACECs) in the land use plans for Public Lands within W-T PD range. A statewide, programmatic, biological evaluation is being prepared for white-tailed prairie dogs, the results of which will be incorporated into the RMPs when it is finished. As you well know, the State of Wyoming, through the Wyoming Game and Fish Department (WGFD), completed a conservation plan for black-tailed prairie dogs in Wyoming a couple of years ago. While this plan was never adopted by the Game and Fish Commission, it did contain a number of management recommendations and planned actions that could apply to white-tailed prairie dogs, as well as B-T PDs. The BLM (WY) has referred to the state conservation plan (even in its unadopted form) to help us focus our prairie dog management efforts and budgeting requests. And, of course, we are anxiously awaiting the completion of the W-T PD Conservation Assessment for the same reasons.

Implementation of land management actions on Public Lands across the state varies somewhat from office to office. A number of prairie dog towns, and some major complexes, are intermingled with oil and gas development and production activities. Generally speaking, most offices do not afford prairie dogs any special sanctuary, although to the extent deemed reasonable, most offices do attempt to avoid prairie dog colonies, and particularly complexes, with surface disturbing development activities. The terms and conditions, and conservation measures, resulting from ESA Sec. 7 consultations with the FWS for other species sometimes dictate the actual prairie dog management measures applied (e.g., distance setbacks from towns, monitoring, etc.). Some offices attach lease notices to O&G leases, and some offices apply conditions of approval (COAs) to APDs. BLM (WO and the WSO) have issued some limited policy for black-tailed prairie dog management (IM No. 99-146, IM No. WY-2000-46, and IM No. 2000-140), and some of this policy instruction has been carried over to white-tailed prairie dogs where it regards commercial hunting activities, recreational shooting, and use of rodenticides for animal damage control.

Monitoring and evaluation of management activities on prairie dogs on BLM administered Public Lands in Wyoming has been nearly non-existent. What little monitoring has occurred has been the result of the outcome of ESA Sec. 7 consultations for other species, or has been incidental discoveries while managing other resource activities. We do hope to collaborate with the WGFD for population and habitat monitoring, as funding allows, when they complete their monitoring protocols for the conservation strategy implementation.

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Appendix IV.

Letter from Colorado BLM to working group with regard to oil and gas development in the white-tailed prairie dog range.

Colorado BLM

White-tailed Prairie Dog Management related to O&G development

July 12, 2004

There are six field offices in Colorado that have some population or geographic distribution of White-tailed prairie dogs (WTPD) within their administrative boundaries. Two of these offices, Little Snake Field Office (FO) and White River FO, include 'Experimental Non-essential Population' Areas for re-introduction efforts of the Black-footed Ferret (BFF), thus providing protection for WTPD through management for BFF's. The following are stipulations and/or management regularly applied to oil and gas development by office.

LSFO – Per local BFF management plan, prairie dog (WTPD) management on Bureau lands will be designed to maintain at least 90 % of the known or potential prairie dog acreage mapped on those lands in 1989.

WTPD colonies are protected by the BLM through lease notice LS-13, which states that "No surface disturbing activities will be allowed that may significantly alter the prairie dog complex making it unsuitable for reintroduction of the black-footed ferret". A leaseholder would not be permitted to develop a lease in a manner that would harm the integrity of a white-tailed prairie dog colony.

WRFO – BFF management objectives include maintaining at least 90% of the occupied extent of prairie dog (WTPD) habitat on BLM surface in the Wolf Creek Management Area (i.e., 15,500 acres) and in the Coyote Basin, CO Management Area (i.e., 700 acres).

The Plan states "Whenever possible, mineral development and utility installation activities will be designed to avoid adverse influence on prairie dog habitat. In the event adverse impacts to prairie dog habitat are unavoidable, activities will be designed to influence the smallest area practicable and/or those areas with the lowest prairie dog densities and compensatory mitigation may be required."

For both field offices, design and location of proposed development may be adjusted per standard lease rights to request delays of implementation up to 60 days and relocation of operations up to 200 meters. There is no standard language related to this protection, but one example could read as follows – 'Proposed well locations will be moved out of active prairie dog towns to minimize direct impacts to the species or associated burrow complex.'

The remaining field offices (Glenwood Springs, Uncompahgre, Grand Junction, and Kremmling) do not have stipulations for oil & gas exploration specific to WTPD's. All offices use to require prairie dog inventories prior to exploration for evaluation of potential BFF habitat (1980s/early 1990s). FWS no longer requires this due to past inventory efforts. In addition, all offices have a stipulation recognizing that modifications of a proposed activity may occur to protect special status species (could apply controlled surface use stipulation, timing stipulation etc). Currently WTPD's are not on the CO BLM sensitive species list. This list is due to be reviewed and/or updated in the near future and WTPD's may be considered for inclusion at that time.

Of these four offices, none have large WTPD complexes, and very few/if any have been in close proximity to recent oil and gas development. Two of the offices said they would request a permittee to locate well sites out of an active PD town within standard lease rights, and the other two have stated this has not been an issue to date.

There are no restrictions, protective measures or discussions related to WTPD expansions within complex boundaries in the state. The focus to date has been maintenance of existing towns and burrows in relation to potential habitat for BFF. Formal protection for the species is incorporated into the local RMP through an associated O&G/BFF amendment (LSFO, WRFO). A few other field offices are incorporating conservation measures informally on a case by case basis. We are in the process of conducting a biological evaluation for this species statewide, analyzing potential impacts from management on BLM lands. Any conservation measures adopted thru this effort will be amended on to all applicable RMP's in 2005 and 2006.

The minerals staff also reviewed the WTPD CA quickly and added a point of clarification. They felt the discussion on potential loss of habitat was misleading. Average well spacing may well be 8.1 ha (20 acres). However, while the initial development of a single well pad affects about 2 acres, shortly after the well is drilled, interim reclamation takes place and the well pad is reduced in size from 2 acres to about .75 acres. Interim reclamation includes seeding of BLM approved plants, and in some cases may actually improve habitat for the species. In addition, co-located wells (as a result of directional drilling) affect proportionately fewer acres than a cumulative well number might represent. Local biologists may agree with this general conclusion as the Rangely oil field in Colorado is a good example of a densely developed production area that appears to have a thriving white-tailed prairie dog population.

Appendix V.

Letter from Montana BLM to working group with regard to oil and gas development in the white-tailed prairie dog range.

The only policy we have regarding W-T prairie dogs and B-T prairie dogs is also related to potential Black-footed ferret reintroductions. "Prior to surface disturbance, prairie dog colonies and complexes of 80 acres or more in size will be examined to determine the absence or presence of black-footed ferrets." -1992, Oil and Gas RMP/ EIS Amendment.

Because we have only about 118 acres of active W-T prairie dog towns, we have had no conflict with O/G leasing. I do review lease parcels and definitely will identify any parcels involving W-T dog towns, with the intention of avoidance of any conflicts or disturbance. Because the acreage of dog towns is so small we have not encountered any conflicts to date.

The Custer National Forest did have a conflict with a potential lease offering and a W-T dog town. I have an email requesting a final resolution to that issue. I'm not sure how they resolved the issue.